



DEPARTMENT OF ENERGY

10 CFR Parts 429 and 430

[EERE-2017-BT-TP-0011]

RIN 1904-AD85

Energy Conservation Program: Test Procedures for General Service Fluorescent Lamps, Incandescent Reflector Lamps, and General Service Incandescent Lamps

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Final rule.

SUMMARY: In this final rule, the U.S. Department of Energy (“DOE”) is adopting amendments to the test procedures for general service fluorescent lamps (“GSFLs”), incandescent reflector lamps (“IRLs”), and general service incandescent lamps (“GSILs”) to update references to industry test standards and provide citations to specific sections of these standards; amend definitions; reference specific sections within industry test standards for further clarity; provide test methods for measuring coloring rendering index (“CRI”) for incandescent lamps and measuring lifetime of IRLs; clarify test frequency and inclusion of cathode power in measurements for GSFLs; decrease the sample size and specify all metrics for all lamps be measured from the same sample; and align terminology across relevant sections of the Code of Federal Regulations relating to GSFLs, IRLs and GSILs.

DATES: The effective date of this rule is [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]. The final rule changes will be mandatory for product testing starting [INSERT DATE 180 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]. The incorporation by reference of certain publications listed in this rule is approved by the Director of the Federal Register on [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE

FEDERAL REGISTER]. The incorporation by reference of certain other publications listed in this rule was approved by the Director of the Federal Register as of June 30, 1997, March 23, 2009, September 14, 2009, and February 27, 2012.

ADDRESSES: The docket, which includes *Federal Register* notices, public meeting attendee lists and transcripts, comments, and other supporting documents/materials, is available for review at www.regulations.gov. All documents in the docket are listed in the www.regulations.gov index. However, some documents listed in the index, such as those containing information that is exempt from public disclosure, may not be publicly available.

A link to the docket web page can be found at www.regulations.gov/document/EERE-2017-BT-TP-0011. The docket web page contains instructions on how to access all documents, including public comments, in the docket. For further information on how to review the docket contact the Appliance and Equipment Standards Program staff at (202) 287-1445 or by email: ApplianceStandardsQuestions@ee.doe.gov.

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SUPPLEMENTARY INFORMATION: DOE incorporates by reference the following industry standards into 10 CFR part 430:

ANSI Standard C78.21-2011 (R2016), “American National Standard for Electric Lamps - PAR and R Shapes,” approved August 23, 2016 (“ANSI C78.21-2011 (R2016)”).

ANSI Standard C78.79-2014 (R2020), “American National Standard for Electric Lamps - Nomenclature for Envelope Shapes Intended for Use with Electric Lamps,” approved January 17, 2020 (“ANSI C78.79-2014 (R2020)”).

ANSI Standard C78.81-2016, “American National Standard for Electric Lamps – Double-Capped Fluorescent Lamps – Dimensional and Electrical Characteristics,” approved June 29, 2016 (“ANSI C78.81-2016”).

ANSI Standard C78.375A-2014 (R2020), “American National Standard for Electric Lamps – Fluorescent Lamps – Guide for Electrical Measures,” approved January 17, 2020 (“ANSI C78.375A-2014 (R2020)”).

ANSI/NEMA Standard C78.901-2016, “American National Standard for Electric Lamps – Single-Based Fluorescent Lamps – Dimensional and Electrical Characteristics,” approved August 23, 2016 (“ANSI/NEMA C78.901-2016”).

ANSI Standard C82.3-2016, “American National Standard for Electric Lamps – Reference Ballasts for Fluorescent Lamps,” approved April 8, 2016 (“ANSI C82.3-2016”).

CIE 015:2018, “Colorimetry, 4th Edition,” copyright 2018 (“CIE 15:2018”).

ANSI/IES Test Method LM-9-20, “ANSI/IES LM-9-2020 Approved Method: Electrical and Photometric Measurement of Fluorescent Lamps,” approved February 7, 2020 (“IES LM-9-20”).

ANSI/IES Test Method LM-20-20, “ANSI/IES LM-20-20 Approved Method: Photometry of Reflector Type Lamps,” approved February 7, 2020 (“IES LM-20-20”).

ANSI/IES Test Method LM-45-20, “ANSI/IES LM-45-20 Approved Method: Electrical and Photometric Measurements of General Service Incandescent Filament Lamps,” approved February 7, 2020 (“IES LM-45-20”).

ANSI/IES Test Method LM-49-20, “ANSI/IES LM-49-20 Approved Method: Life Testing of Incandescent Filament Lamps,” approved February 7, 2020 (“IES LM-49-20”).

ANSI/IES Test Method LM-54-20, “ANSI/IES LM-54-20 Approved Method: IES Guide to Lamp Seasoning,” approved February 7, 2020 (“IES LM-54-20”).

ANSI/IES Test Method LM-58-20, “ANSI/IES LM-58-20 Approved Method: Spectroradiometric Measurement Methods for Light Sources,” approved February 7, 2020 (“IES LM-58-20”).

ANSI/IES Test Method LM-78-20, “ANSI/IES LM-78-20 Approved Method: Total Luminous Flux Measurement of Lamps Using an Integrating Sphere Photometer,” approved February 7, 2020 (“IES LM-78-20”).

Copies of ANSI C78.21-2011(R2016), ANSI C78.79-2014(R2020), ANSI C78.81-2016, ANSI C78.375A-2014(R2020), ANSI/NEMA C78.901-2016, and ANSI C82.3-2016 are available from the American National Standards Institute (ANSI) at www.ansi.org or the National Electrical Manufacturers Association (NEMA) at www.nema.org.

Copies of CIE 15:2018 are available from the International Commission on Illumination (“CIE”) at cie.co.at/publications.

Copies of IES LM-9-20, IES LM-20-20, IES LM-45-20, IES LM-49-20, IES LM-54-20, IES LM-58-20, and IES LM-78-20 are available from ANSI at www.ansi.org or from the Illuminating Engineering Society (“IES”) at www.ies.org/store.

For a further discussion of these standards, see section IV.N.

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I. Authority and Background

GSFLs, IRLs, and GSILs are included in the list of “covered products” for which DOE is authorized to establish and amend energy conservation standards and test procedures. (42 U.S.C. 6292(a)(14)) DOE’s test procedures for GSFLs, IRLs, and GSILs appear at title 10 of the Code of Federal Regulations (“CFR”) part 430, subpart B, appendix R (“appendix R”). The following sections discuss DOE’s authority to establish

and amend test procedures for GSFLs, IRLs, and GSILs, as well as relevant background information regarding DOE’s amendments to the test procedures for these products.

A. Authority

The Energy Policy and Conservation Act, as amended (“EPCA”),¹ authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. (42 U.S.C. 6291–6317) Title III, Part B² of EPCA established the Energy Conservation Program for Consumer Products Other Than Automobiles, which sets forth a variety of provisions designed to improve energy efficiency. These products include GSFLs, IRLs, and GSILs, the subject of this document. (42 U.S.C. 6292(a)(14))

The energy conservation program under EPCA consists essentially of four parts: (1) testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification and enforcement procedures. Relevant provisions of EPCA specifically include definitions (42 U.S.C. 6291), test procedures (42 U.S.C. 6293), labeling provisions (42 U.S.C. 6294), energy conservation standards (42 U.S.C. 6295), and the authority to require information and reports from manufacturers (42 U.S.C. 6296).

The testing requirements consist of test procedures that manufacturers of covered products must use as the basis for (1) certifying to DOE that their products comply with the applicable energy conservation standards adopted under EPCA (42 U.S.C. 6295(s)), and (2) making other representations about the efficiency of those products (42 U.S.C. 6293(c)). Similarly, DOE must use these test procedures to determine whether the products comply with any relevant standards promulgated under EPCA. (42 U.S.C. 6295(s))

¹ All references to EPCA in this document refer to the statute as amended through the Energy Act of 2020, Pub. L. 116-260 (Dec. 27, 2020), which reflect the last statutory amendments that impact Parts A and A-1 of EPCA.

² For editorial reasons, upon codification in the U.S. Code, Part B was redesignated Part A.

Federal energy efficiency requirements for covered products established under EPCA generally supersede State laws and regulations concerning energy conservation testing, labeling, and standards. (42 U.S.C. 6297) DOE may, however, grant waivers of Federal preemption for particular State laws or regulations, in accordance with the procedures and other provisions of EPCA. (42 U.S.C. 6297(d))

Under 42 U.S.C. 6293, EPCA sets forth the criteria and procedures DOE must follow when prescribing or amending test procedures for covered products. EPCA requires that any test procedures prescribed or amended under this section shall be reasonably designed to produce test results which measure energy efficiency, energy use or estimated annual operating cost of a covered product during a representative average use cycle (as determined by the Secretary) or period of use and shall not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3))

EPCA, as codified, directs DOE to prescribe test procedures for fluorescent lamps and IRLs, taking into consideration the applicable standards of IES or ANSI. (42 U.S.C. 6293(b)(6)) Consideration of IES and ANSI standards aligns DOE test procedures with latest industry practices for testing electric lamps; therefore, DOE also considers these industry test standards when prescribing test procedures for GSILs.

EPCA also requires that, at least once every 7 years, DOE evaluate test procedures for each type of covered product, including GSFLs, IRLs, and GSILs, to determine whether amended test procedures would more accurately or fully comply with the requirements for the test procedures to not be unduly burdensome to conduct and be reasonably designed to produce test results that reflect energy efficiency, energy use, and estimated operating costs during a representative average use cycle or period of use. (42 U.S.C. 6293(b)(1)(A))

If the Secretary determines, on her own behalf or in response to a petition by any interested person, that a test procedure should be prescribed or amended, the Secretary

shall promptly publish in the *Federal Register* proposed test procedures and afford interested persons an opportunity to present oral and written data, views, and arguments with respect to such procedures. The comment period on a proposed rule to amend a test procedure shall be at least 60 days and may not exceed 270 days. In prescribing or amending a test procedure, the Secretary shall take into account such information as the Secretary determines relevant to such procedure, including technological developments relating to energy use or energy efficiency of the type (or class) of covered products involved. (42 U.S.C. 6293(b)(2)). If DOE determines that test procedure revisions are not appropriate, DOE must publish its determination not to amend the test procedures.

In addition, EPCA requires that DOE amend its test procedures for all covered products to integrate measures of standby mode and off mode energy consumption into the overall energy efficiency, energy consumption, or other energy descriptor, unless the current test procedure already incorporates the standby mode and off mode energy consumption, or if such integration is technically infeasible. (42 U.S.C. 6295(gg)(2)(A)) If an integrated test procedure is technically infeasible, DOE must prescribe separate standby mode and off mode energy use test procedures for the covered product, if a separate test is technically feasible. (*Id.*) Any such amendment must consider the most current versions of the International Electrotechnical Commission (“IEC”) Standard 62301³ and IEC Standard 62087⁴ as applicable. (42 U.S.C. 6295(gg)(2)(A))

DOE is publishing this final rule in satisfaction of the 7-year review requirement specified in EPCA. (42 U.S.C. 6293(b)(1)(A))

³ IEC 62301, *Household electrical appliances—Measurement of standby power* (Edition 2.0, 2011-01).

⁴ IEC 62087, *Audio, video and related equipment—Methods of measurement for power consumption* (Edition 1.0, Parts 1–6: 2015, Part 7: 2018).

B. Background

DOE's existing test procedures for GSFLs, IRLs, and GSILs appear at appendix R ("Uniform Test Method for Measuring Average Lamp Efficacy ("LE"), Color Rendering Index ("CRI"), and Correlated Color Temperature ("CCT") of Electric Lamps").

DOE most recently amended the test procedures for GSFLs and GSILs in a final rule published on January 27, 2012. 77 FR 4203. DOE updated several references to the industry test standards referenced in DOE's test procedures and established a lamp lifetime test method for GSILs. *Id.* In that final rule, DOE determined that amendments to the existing test procedure for IRLs were not necessary. *Id.*

On August 8, 2017, DOE published in the *Federal Register* a request for information ("RFI") seeking comments on the current test procedures for GSFLs, IRLs, and GSILs. 82 FR 37031 ("August 2017 RFI"). On June 3, 2021, DOE published in the *Federal Register* a notice of proposed rulemaking ("NOPR") proposing amendments to the current test procedures for GSFLs, IRLs, and GSILs. 86 FR 29888 ("June 2021 NOPR").

DOE received comments in response to the June 2021 NOPR from the interested parties listed in Table I.1.

Table I.1 List of Commenters with Written Submissions in Response to the June 2021 NOPR

Commenter(s)	Reference in this Final Rule	Comment No. in the Docket	Commenter Type
National Electrical Manufacturers Association	NEMA	12	Industry Association
Pacific Gas and Electric Company, San Diego Gas and Electric, and Southern California Edison; collectively, the California Investor-Owned Utilities	CA IOUs	13	Utility
Illuminating Engineering Society	IES	14	Industry Association

This document addresses information and comments received in response to the June 2021 NOPR. A parenthetical reference at the end of a comment quotation or paraphrase provides the location of the item in the public record.⁵

II. Synopsis of the Final Rule

In this final rule, DOE amends 10 CFR part 429, 430.2, 430.3, 430.23, 430.32, and appendix R as follows: (1) updates references to industry test standards to reflect current industry practices; (2) modifies, adds, and removes definitions to better align with the scope and test methods; (3) references specific sections within industry test standards for further clarity; (4) provides a test method for measuring CRI for incandescent lamps to support DOE requirements; (5) provides a test method for measuring lifetime of incandescent reflector lamps to support the Federal Trade Commission's ("FTC's") labeling requirements; (6) clarifies test frequency and inclusion of cathode power in measurements for GSFLs; (7) decreases the sample size and specifies all metrics for all lamps be measured from the same sample of units. In addition, this final rule aligns

⁵ The parenthetical reference provides a reference for information located in the docket of DOE's rulemaking to develop test procedures for GSFLs, IRLs, and GSILs. (Docket No. EERE-2017-BT-TP-0011, which is maintained at www.regulations.gov). The references are arranged as follows: (commenter name, comment docket ID number, page of that document).

terminology across appendix R, the relevant sections of 10 CFR part 429, 430.23(r), 430.32(n) and 430.32(x) and updates language for conciseness and clarity.

The adopted amendments are summarized in Table II.1 of this document compared to the test procedure provision prior to the amendment, as well as the reason for the adopted change.

Table II.1 Summary of Changes in the Amended Test Procedure

DOE Test Procedure Prior to Amendment	Amended Test Procedure	Attribution
References lamp data sheets in the 2010 version of ANSI C78.81 and 2005 version of ANSI C78.901 to specify the appropriate reference ballast to use when testing a particular lamp.	Adopts newer versions of ANSI standards only for voluntary representations for GSFLs at high frequency settings.	Harmonize with updated industry standard.
References of ANSI C78.375, ANSI C82.3, IES LM-9, IES LM-58, IES LM-45, IES LM-49, IES LM-20, CIE 15.	Adopts latest versions of these referenced industry standards.	Harmonize with updated industry standard.
Does not clearly state in all instances whether testing for GSFLs should be performed at low or high frequency and whether cathode power should be included.	Clarifies in all instances whether testing should be performed at low or high frequency and whether cathode power should be included.	Improve reproducibility of test results.
Does not include a method for determining CRI of incandescent lamps.	Adds test method for measuring CRI for GSILs and IRLs.	Provide test method to comply with the statutory minimum CRI requirement.
Does not include a method for determining lifetime of incandescent reflector lamps.	Adds test method for measuring lifetime of incandescent reflector lamps.	Support FTC labeling requirements.
Definitions of IRL types do not reference the latest industry standards.	Updates definitions for BPAR, R20, ER, and BR incandescent reflector lamps and defines PAR and R incandescent lamps with references to latest versions of ANSI C78.21-2011 (R2016) and ANSI C78.79-2014 (R2020), as appropriate.	Reference latest industry standards.
Specifies only CRI to be measured from the same sample of units.	Specifies all metrics for all lamps be measured from the same sample of units.	Improve representativeness of test results.
Requires testing a minimum of 21 lamps by selecting a minimum of three lamps from each month of production for a minimum of 7 out of a 12-month period.	Decreases the minimum number of lamps tested to be 10 instead of 21 and removes the requirement for lamps to be selected from at least 7 different months of a 12-month period.	Align sampling requirements with those of other lighting products.
Includes inconsistent terminology across appendix R, 10 CFR part 429, 430.23(r), 430.32(n), and 430.32(x).	Aligns terminology across appendix R, the 10 CFR 429 sections, and 10 CFR 430.23(r), 430.32(n), and 430.32(x).	Improve readability of test procedure.

DOE has determined that the amendments described in section III of this document and adopted in this document will not alter the measured efficiency of GSFLs,

IRLs, or GSILs, or require retesting or recertification solely as a result of DOE's adoption of the amendments to the test procedures. Additionally, DOE has determined that the amendments will not increase the cost of testing. Discussion of DOE's actions are addressed in detail in section III of this document.

The effective date for the amended test procedures adopted in this final rule is 30 days after publication of this document in the *Federal Register*. Representations of energy use or energy efficiency must be based on testing in accordance with the amended test procedures beginning 180 days after the publication of this final rule.

III. Discussion

In response to the June 2021 NOPR, DOE received several comments on the proposed amendments. The CA IOUs stated general support for updating the GSFL, IRL, and GSIL test procedures and encouraged the process to proceed expeditiously. (CA IOUs, No. 13 at pp. 2-3) Other comments addressed specific topics including updates to industry standards incorporated by reference, test methodologies, sampling and certification requirements, and test procedures costs and impacts. DOE discusses the comments received on the June 2021 NOPR in the following sections.

A. Scope of Applicability

This final rule covers those consumer products that meet the definitions of “general service fluorescent lamp,” “incandescent reflector lamp,” and “general service incandescent lamp” as codified in DOE’s regulations at 10 CFR 430.2.

DOE defines a general service fluorescent lamp as a lamp that can be used to satisfy the majority of fluorescent lighting applications; and also specifies that it cannot be designed and marketed for eight non-general applications. 10 CFR 403.2.

DOE defines an incandescent reflector lamp to mean any lamp in which light is produced by a filament heated to incandescence by an electric current and that: (1) has an inner reflective coating on the outer bulb to direct the light; (2) is not colored; (3) is not

designed for rough or vibration service applications; (3) is not an R20 short lamp; (3) has an R, PAR, ER, BR, BPAR, or similar bulb shapes with an E26 medium screw base; (4) has a rated voltage or voltage range between 115 and 130 volts; (5) has a diameter greater than 2.25 inches; and (6) has a rated wattage that is 40 watts or higher. 10 CFR 430.2.

DOE defines a general service incandescent lamp as an incandescent or halogen lamp type intended for general service applications and that: (1) has a medium screw base; (2) has a lumen range of not less than 310 lumens and not more than 2,600 lumens or, in the case of a modified spectrum lamp, not less than 232 lumens and not more than 1,950 lumens; and (3) has a voltage range between 110 and 130 volts. The definition also specifies 16 types of lamps to which the definition does not apply. 10 CFR 430.2.

DOE received comments regarding rulemaking scope in response to the June 2021 NOPR.

The CA IOUs commented that under DOE's definitional rulemaking published on January 19, 2017,⁶ GSILs, IRLs, compact fluorescent lamps ("CFLs"), as well as integrated light-emitting diode ("LED") lamps and organic light-emitting diode ("OLED") lamps are general service lamps ("GSLs"). The CA IOUs asserted that the statutory GSL efficacy requirement of 45 lumens per watt ("lm/W") (*i.e.*, the "backstop")⁷ has been triggered. The CA IOUs stated that applying the 45 lm/W

⁶ On January 19, 2017, DOE published two final rules ("January 2017 Definition Final Rules") revising the definitions of GSL and GSIL by bringing certain categories of lamps that had been excluded by statute from the definition of GSIL within the definitions of GSIL and GSL. 82 FR 7276; 82 FR 7322. On September 5, 2019, DOE published a final rule withdrawing the definitions in the January 2017 Definition Final Rules and instead maintained the existing regulatory definitions of GSL and GSIL. 84 FR 46661. On August 19, 2021, DOE published a NOPR proposing to amend the existing regulatory definitions of GSL and GSIL to be those specified in the January 2017 Definition Final Rules. 86 FR 46611. On May 9, 2022, DOE published a final rule adopting definitions of GSL and GSIL and associated supplemental definitions as set forth in the January 2017 Definition Final Rules. 87 FR 27461 ("May 2022 Definition Final Rule").

⁷ EPCA directs DOE to initiate a rulemaking process for GSLs prior to January 1, 2014, to determine whether: (1) to amend energy conservation standards for GSLs and (2) the exemptions for certain incandescent lamps should be maintained or discontinued. (42 U.S.C. 6295(i)(6)(A)(i)) The rulemaking is not limited to incandescent lamp technologies and must include a consideration of a minimum standard of 45 lumens per watt for GSLs. (42 U.S.C. 6295(i)(6)(A)(ii)) EPCA provides that if the Secretary determines that the standards in effect for GSILs should be amended, a final rule must be published by January 1, 2017, with a compliance date at least 3 years after the date on which the final rule is published. (42 U.S.C. 6295(i)(6)(A)(iii)) The Secretary must also consider phased-in effective dates after considering certain

standard across different lamps with common consumer utility would be a significant step towards a technology-neutral approach to regulating lighting efficiency. The CA IOUs further stated that GSILs and IRLs are both GSLs per DOE regulation and therefore are subject to the GSL test procedure published by DOE in September 2016⁸. (CA IOUs, No. 13 at p. 2)

In the May 2022 Definition Final Rule and May 2022 Backstop Final Rule, DOE addressed the CA IOUs comments regarding the applicability of the 45 lm/W backstop requirement for GSLs. The May 2022 Backstop Final Rule codified the backstop requirement for GSLs, which includes IRLs and GSILs. Further, DOE provides test procedures for all GSLs in certain appendices to subpart B of 10 CFR part 430. DOE's test procedure codified in appendix DD, *Uniform Test Method for Measuring the Energy Consumption and Energy Efficiency of General Service Lamps That Are Not General Service Incandescent Lamps, Compact Fluorescent Lamps, or Integrated LED Lamps*, applies as the title indicates to all GSLs that are not GSILs, CFLs, or integrated LED lamps. The DOE test procedure for GSILs and IRLs is codified in appendix R; the DOE test procedure for CFLs is codified in appendix W, *Uniform Test Method for Measuring the Energy Consumption of Compact Fluorescent Lamps*; and the DOE test procedure for integrated LED lamps is codified in appendix BB, *Uniform Test Method for Measuring the Input Power, Lumen Output, Lamp Efficacy, Correlated Color Temperature (CCT), Color Rendering Index (CRI), Power Factor, Time to Failure, and Standby Mode Power of Integrated Light-Emitting Diode (LED) Lamps*. The scope of this rulemaking is

manufacturer and retailer impacts. (42 U.S.C. 6295(i)(6)(A)(iv)) If DOE fails to complete a rulemaking in accordance with 42 U.S.C. 6295(i)(6)(A)(i)-(iv), or if the final rule does not produce savings greater than or equal to the savings from a minimum efficacy standard of 45 lm/W, the statute provides a "backstop" under which DOE must prohibit sales of GSLs that do not meet a minimum 45 lm/W standard. (42 U.S.C. 6295(i)(6)(A)(v)) On May 9, 2022, DOE published a final rule codifying the 45 lm/W backstop requirement. 87 FR 27439 ("May 2022 Backstop Final Rule").

⁸ On October 20, 2016, DOE published a final rule adopting test procedures for GSLs that are not general service incandescent lamps, compact fluorescent lamps, or integrated light-emitting diode ("LED") lamps. The test procedures were codified in 10 CFR part 430, subpart B, appendix DD. 81 FR 72493.

limited to the review and revision of appendix R and the associated sampling and certification requirements.

B. Incorporation by Reference of Industry Test Standards

The GSFL, IRL, and GSIL test procedures described in appendix R reference certain ANSI and IES standards. Industry periodically updates its testing standards to account for changes in technology, developments in test methodology, developments in test instruments, and/or changes in industry practice. Several of the referenced industry test standards have been updated by industry since DOE last amended its test procedures for GSFLs, IRLs and GSILs. In the June 2021 NOPR, DOE identified updated versions of the referenced industry standards incorporated by reference for appendix R as shown in Table III.1 of this document. DOE tentatively determined that the proposed updates to industry test standard references are clarifications and would not involve substantive changes to the test setup and methodology. 86 FR 29888, 29892. DOE also initially determined that incorporation by reference of the latest versions of the industry standards would better align DOE test procedures with industry practice and further increase the clarity of the test methods. *Id.* DOE requested comment in the June 2021 NOPR on its proposed adoption of the updated versions of the referenced industry test standards and its tentative determination that such adoption would not result in substantive changes to the DOE test procedure. *Id.*

NEMA commented that it approved of adopting the latest versions of consensus standards proposed in the June 2021 NOPR. NEMA stated that none of the standards for which NEMA is Secretariat are slated for updates within the next six months and recommended that DOE proceed as proposed without concern as to whether new versions of the consensus standards are imminent. (NEMA, No. 12 at p. 2) IES stated that all IES standards have been elevated to ANSI status over the past two years and that it is an appropriate practice for DOE to adopt ANSI standards when they are available. IES also

noted that previous versions of IES standards referenced by DOE are no longer supported or sold by IES. IES also requested that DOE reference its standards with the initialism “IES” rather than “IESNA” and noted its new resource for illumination engineering terms, ANSI/IES LS-1-20, *Lighting Science: Nomenclature and Definitions for Illuminating Engineering*. (IES, No. 14 at pp. 1-2)

At the time of this final rule analysis, DOE did not identify more recent versions of industry standards than those proposed for adoption in the June 2021 NOPR. For the reasons discussed in the June 2021 NOPR and in the preceding paragraphs, DOE is adopting the latest versions of industry standards as proposed in the June 2021 NOPR. Further, for purposes of reference and accuracy, DOE specifies industry standards in the CFR according to the titles that appear in the industry test standard publication. DOE reviewed the titles of the relevant industry test standards to determine if they were accurately specified in the June 2021 NOPR. DOE determined that in the June 2021 NOPR it had erroneously specified the title of the 2020 version of standard LM-78 with “IESNA,” whereas it is labeled as “IES” in the industry test standard publication. Accordingly, in this final rule, DOE has included the title of this industry standard using the initialism “IES.” DOE also reviewed ANSI/IES LS-1-20 and did not find terms in DOE’s GSFL, IRL, and GSIL test procedures that required reference to ANSI/IES LS-1-20.

Table III.1 Industry Standards Referenced in Appendix R with Updated Versions Adopted in Final Rule

Industry Standard Currently Referenced in Appendix R	Updated Version Adopted in this Final Rule*
ANSI C78.375 version 1997 ⁹ (section 4.1.1 of appendix R)	ANSI C78.375A version 2020 ¹⁰

⁹ American National Standards Institute, *ANSI C78.375-1997, Revision of ANSI C78.375-1991, American National Standard for electric lamps: Fluorescent Lamps - Guide for Electrical Measurements*. Approved September 25, 1997.

¹⁰ American National Standards Institute, *ANSI C78.375A-2014 (R2020) Revision of ANSI C78.375-2014, American National Standard for Electric Lamps-Fluorescent Lamps-Guide for Electrical Measures*. Approved January 17, 2020.

ANSI C78.81 version 2010 ¹¹ (section 4.1.1 of appendix R)	ANSI C78.81 version 2016 ¹² (adopted for voluntary representations)
ANSI C78.901 version 2005 ¹³ (section 4.1.1 of appendix R)	ANSI C78.901 version 2016 ¹⁴ (adopted for voluntary representations)
ANSI C82.3 version 2002 ¹⁵ (section 4.1.1 of appendix R)	ANSI C82.3 version 2016 ¹⁶
IES LM-9 version 2009 ¹⁷ (sections 2.1, 2.9, 3.1, 4.1.1, 4.4.1 of appendix R)	IES LM-9 version 2020 ¹⁸
IESNA LM-58 version 1994 ¹⁹ (sections 2.1, 4.4.1 of appendix R)	IES LM-58 (retitled) version 2020 ²⁰
IES LM-45 version 2009 ²¹ (sections 2.1, 2.9, 3.2, 4.2.1, 4.2.2 of appendix R)	IES LM-45 version 2020 ²²
IESNA LM-49 version 2001 ²³ (section 4.2.3 of appendix R)	IES LM-49 (retitled) version 2020 ²⁴
IESNA LM-20 version 1994 ²⁵ (sections 2.1, 2.9, 3.3, 4.3 of appendix R)	IES LM-20 (retitled) version 2020 ²⁶
CIE 15 version 2004 ²⁷ (section 4.4.1 of appendix R)	CIE 15 version 2018 ²⁸

*Note: Additionally, this final rule incorporates by reference IES LM-54-20 and IES LM-78-20 in appendix R.

¹¹ American National Standards Institute, *ANSI/ANSI C78.81-2010 Revision of ANSI C78.81-2005. American National Standard for Electric Lamps—Double-Capped Fluorescent Lamps— Dimensional and Electrical Characteristics*. Approved January 14, 2010.

¹² American National Standards Institute, *ANSI C78.81-2016 American National Standard for Electric Lamps—Double-Capped Fluorescent Lamps— Dimensional and Electrical Characteristics*. Approved June 29, 2016.

¹³ American National Standards Institute, *ANSI/IEC C78.901-2005 Revision of ANSI C78.901-2001, American National Standards for Electric Lamps – Single-Based Fluorescent Lamps – Dimensional and Electrical Characteristics*. Approved March 23, 2005.

¹⁴ American National Standards Institute, *ANSI/NEMA C78.901-2016 American National Standards for Electric Lamps – Single-Based Fluorescent Lamps – Dimensional and Electrical Characteristics*. Approved August 23, 2016.

¹⁵ American National Standards Institute, *ANSI C82.3-2002 American National Standard For Lamp Ballasts—Reference Ballasts for Fluorescent Lamps*. Approved January 1, 2002.

¹⁶ American National Standards Institute, *ANSI C82.3-2016 American National Standard For Reference Lamp Ballasts for Fluorescent Lamps*. Approved April 8, 2016.

¹⁷ Illuminating Engineering Society of North America, *IES LM-9-09 IES Approved Method for the Electrical and Photometric Measurements of Fluorescent Lamps*. Approved January 31, 2009.

¹⁸ Illuminating Engineering Society, *ANSI/IES LM-9-20—Approved Method: Electrical and Photometric Measurements of Fluorescent Lamps*. Approved February 7, 2020.

¹⁹ Illuminating Engineering Society of North America, *LM-58 IESNA Guide to Spectroradiometric Measurements*. Approved December 3, 1994.

²⁰ Illuminating Engineering Society, *ANSI/IES LM-58-20 Approved Method: Spectroradiometric Measurement Methods for Light Sources*. Approved February 7, 2020.

²¹ Illuminating Engineering Society, *IES LM-45-09 IES Approved Method for The Electrical and Photometric Measurement of General Service Incandescent Filament Lamps*. Approved December 14, 2009.

²² Illuminating Engineering Society, *ANSI/IES LM-45-20 Approved Method: Electrical and Photometric Measurement of General Service Incandescent Filament Lamps*. Approved February 7, 2020.

²³ Illuminating Engineering Society, *IES LM-49-01 Approved Method: Life Testing of Incandescent Filament Lamps*. Approved December 1, 2001.

²⁴ Illuminating Engineering Society, *ANSI/IES LM-49-20 Approved Method: Life Testing of Incandescent Filament Lamps*. Approved February 7, 2020.

²⁵ Illuminating Engineering Society of North America, *LM-20 IESNA Approved Method for Photometric Testing of Reflector-Type Lamps*. Approved December 3, 1994.

²⁶ Illuminating Engineering Society, *ANSI/IES LM-20-20 Approved Method: Photometry of Reflector Type Lamps*. Approved February 7, 2020.

²⁷ International Commission on Illumination, *Colorimetry, 3rd Edition*. Approved 2004.

²⁸ International Commission on Illumination, *Colorimetry, 4th Edition*. Approved 2018.

Table III.1 shows the industry test standards currently referenced in appendix R and the updated version that DOE has adopted in this final rule. In addition, DOE is incorporating by reference IES LM-54-20²⁹ (the industry standard for lamp seasoning) and IES LM-78-20³⁰ (the industry standard for using an integrating sphere) for appendix R. IES LM-54-20 and IES LM-78-20 are referenced by IES LM-9-20, IES LM-20-20, and IES LM-45-20 for testing the performance of GSFLs, IRLs, and GSILs, respectively.

DOE has determined that, because these updates to industry standard references do not involve substantive changes to the test setup and methodology but rather clarifications that align DOE's test procedures with latest industry best practices, they would not affect measured values. Hence, in this final rule, DOE incorporates by reference for appendix R the industry standards ANSI C78.375A-2014 (R2020), ANSI C78.81-2016 (adopted for voluntary representations, as described further in this section), ANSI C78.901-2016 (adopted for voluntary representations, as described further in this section), ANSI C82.3-2016, IES LM-9-20, IES LM-58-20, IES LM-45-20, IES LM-49-20, IES LM-20-20, IES LM-54-20, IES LM-78-20, and CIE 15:2018.

For certain lamps, in the latest versions of the industry standards ANSI C78.81-2016 and ANSI C78.901-2016, only high frequency reference ballast settings are specified, whereas previously low frequency settings were provided.³¹ Because cathode heat is not used at high frequency, the measured lamp efficacy would likely increase during high frequency operation compared to low frequency operation. DOE's test procedure requires testing at low frequency unless only high frequency settings are

²⁹ Illuminating Engineering Society, *ANSI/IES LM-54-20 Approved Method: IES Guide to Lamp Seasoning*. Approved February 7, 2020.

³⁰ Illuminating Engineering Society, *ANSI/IES LM-78-20 Approved Method: Total Luminous Flux Measurement of Lamps Using an Integrating Sphere Photometer*. Approved February 7, 2020.

³¹ ANSI C78.81-2016 and/or ANSI C78.901-2016 remove low frequency reference ballast settings and provide only high frequency reference ballast settings for the following lamps: 32 Watt ("W"), 48-Inch T8 lamp; 32 W U-shaped, 6-Inch Center T8 lamp; 31 W, U-shaped, 1-5/8 Inch Center T8 lamp; 59 W, 96-Inch T8, Single Pin Instant Start lamp; and 25 W, 28 W, and 30 W 48-Inch T8 lamps. Additionally, two new lamp data sheets were added providing only high frequency reference ballast settings for the following lamps: 30 W, U-shaped, 6-Inch Center T8 lamp and 54 W 96-Inch T8, Single Pin Instant Start lamp.

provided. Hence, the adoption of ANSI C78.81-2016 and ANSI C78.901-2016, which specify only high frequency ballast settings for certain lamps, would result in certain lamps that were previously tested at low frequency being tested at high frequency, negating the consideration of cathode heat.

In the June 2021 NOPR, DOE proposed to maintain the current references to ANSI C78.81-2010 and ANSI C78.901-2005 for determining compliance and to add provisions to allow manufacturers to make voluntary representations of applicable GSFLs at the high frequency settings specified in the 2016 versions of ANSI C78.81 and ANSI C78.901 in accordance with test procedures specified in appendix R and associated sampling requirements. The voluntary representations would not be used for compliance but rather would be in addition to values obtained for compliance and used for determining if and how standards for GSFLs should be amended to accommodate testing at high frequency settings. 86 FR 29888, 29894.

NEMA commented that it supports conducting GSFL tests using high frequency reference ballasts for purposes of making product performance claims. NEMA did not support use of high frequency ballast settings for the purposes of certification to DOE. NEMA commented that tests conducted using high frequency ballasts produce different results from those conducted on older technology. Further, NEMA commented that amending the DOE test procedure to use high frequency ballasts would add unnecessary burden without any benefit, because there is no new product development in GSFL technology, the technology is mature, and sales are declining. (NEMA, No. 12 at p. 2)

As discussed in the June 2021 NOPR, DOE understands that the change in measured efficacy when testing on high frequency versus low frequency settings resulting from updated versions of ANSI C78.81 and ANSI C78.901 is not de minimis. 86 FR 29888, 29894. Adoption of test procedures that reference the latest versions of ANSI C78.81 and ANSI C78.901 would impact compliance under the current GSFL

energy conservation standards and require reassessment of the energy conservation standards based on measured values tested according to DOE test procedures using the updated industry test standards (*e.g.*, ANSI C78.81-2016 and ANSI C78.901-2016). *Id.* For these reasons and those discussed in the June 2021 NOPR, DOE is maintaining the ballast frequency specifications through references to ANSI C78.81-2010 and ANSI C78.901-2005 for determining compliance, as proposed. DOE is adding provisions to allow manufacturers to make voluntary representations of applicable GSFLs at the high frequency settings specified in the 2016 versions of ANSI C78.81 and ANSI C78.901 in accordance with test procedures specified in appendix R and associated sampling requirements. DOE will not use the voluntary representations to determine compliance with GSFL energy conservation standards. DOE may consider voluntary representations to evaluate whether standards for GSFLs should be amended to accommodate testing at high frequency settings.

In this final rule, as proposed in the June 2021 NOPR, DOE is providing instructions in a new section 5.0 in appendix R for making voluntary representations for GSFLs that have high frequency reference ballast settings in ANSI C78.81-2016 and ANSI C78.901-2016.

C. Amendments to Appendix R

In this final rule, DOE amends appendix R to improve the organization of the test procedures, further clarify test conditions and measurement steps, and cite specific sections of referenced industry test standards. Additionally, in this final rule, DOE removes references to rounding and sample size from appendix R, as these requirements are addressed in 10 CFR 429.27, and also removes references to minimum lifetime standards, as these are provided in 10 CFR 430.32(x)(1)(iii)(A)-(B). DOE has determined that these updates to appendix R are not substantive, improve the clarity and consistency of the test method, provide explicit instructions for test methods likely

already in use, and thereby, will not affect measured values. DOE details these amendments to appendix R in the following subsections.

1. Definitions

In the June 2021 NOPR, DOE proposed to add and define the term “time to failure” to support the procedure for determining lamp lifetime of lamps that use incandescent technology. 86 FR 29888, 29899. Section 4.2.3 of appendix R specifies a measurement procedure for testing the lifetime of GSILs. Furthermore, DOE’s sampling plan for GSFLs at 10 CFR 429.27 specifies sampling requirements and procedures for determining a basic model’s rated lifetime. 10 CFR 429.27(a)(2)(iv). As discussed further in section III.D.3 of this document, in the June 2021 NOPR, DOE proposed to remove language in 10 CFR 429.27(a)(2)(iv) stating that lifetime is the length of operating time between first use and failure of 50 percent of the sample size, and to instead directly describe what failure of 50 percent sample size means by specifying that the represented value of lifetime is equal to or less than the median time to failure of the sample. DOE proposed that this change would apply to both GSILs and IRLs (in newly proposed representation requirements for IRLs). To support these changes, DOE proposed in the June 2021 NOPR to add a definition in appendix R for “time to failure,” as well as test methods, measurements, and calculations for determining time to failure, as discussed further in section III.C.4 of this document. In appendix R, DOE proposed to define “time to failure” as the time elapsed between first use and the point at which the lamp ceases to produce measurable lumen output. *Id.*

In the June 2021 NOPR, DOE also proposed certain changes related to the definition of “lamp efficacy.” Section 2.6 of appendix R defines “lamp efficacy” as the ratio of measured lamp lumen output in lumens to the measured lamp electrical power input in watts, rounded to the nearest tenth, in units of lumens per watt. DOE also defines “lamp efficacy” at 10 CFR 430.2 as the measured lumen output of a lamp in

lumens divided by the measured lamp electrical power input in watts expressed in units of lumens per watt. In the June 2021 NOPR, DOE proposed to replace the term “lamp efficacy” with “initial lamp efficacy,” and to simplify and clarify the definition by: (1) referencing lamp efficacy as defined in 10 CFR 430.2; (2) specifying that the value is determined after the lamp is stabilized and seasoned; and (3) removing references to rounding requirements, which DOE proposed to be addressed in 10 CFR 429.27 (see section III.D.5 for details on DOE’s amendments to rounding requirements in 10 CFR 429.27). 86 FR 29888, 29899.

In the June 2021 NOPR, DOE also proposed certain changes related to the definition of “lamp lumen output.” Section 2.7 of appendix R defines “lamp lumen output” as the total luminous flux produced by the lamp, at the reference condition, in units of lumens. DOE proposed to replace the term “lamp lumen output” with “initial lumen output” and to simplify the definition to “lumen output of the lamp,” and add the clarification that the initial lumen output of the lamp is measured at the end of the lamp seasoning and stabilization. *Id.*

In the June 2021 NOPR, DOE also proposed certain changes related to the definition of “lamp electrical power input.” Section 2.8 of appendix R defines “lamp electrical power input” as the total electrical power input to the lamp, including both arc and cathode power where appropriate, at the reference condition, in units of watts. DOE proposed to replace the term “lamp electrical power input” with “initial input power,” and to simplify the definition to “the input power to the lamp,” and add the clarification that initial input power of the lamp is measured at the end of the lamp seasoning and stabilization. *Id.* DOE explained in the June 2021 NOPR that these proposed changes would more accurately describe the values being determined and measured by the test methods in appendix R. *Id.*

Section 2.9 of appendix R defines “reference condition” as the test condition specified in IES LM-9 for general service fluorescent lamps, in IESNA LM-20 for incandescent reflector lamps, and in IES LM-45 for general service incandescent lamps. In the June 2021 NOPR, DOE proposed to remove the term “reference condition” because it is neither referenced in nor necessary for the test procedure. 86 FR 29888, 29899.

Section 2.2 of appendix R defines “ANSI Standard” as a standard developed by a committee accredited by the American National Standards Institute. Section 2.3 of appendix R defines “CIE” as the International Commission on Illumination. Section 2.5 of appendix R defines “IESNA” as the Illuminating Engineering Society of North America. In the June 2021 NOPR, DOE proposed to remove these definitions for “ANSI Standard,” “CIE,” and “IESNA” in appendix R because 10 CFR 430.3 contains the relevant terms – specifically, “ANSI”, “CIE”, and “IESNA” and the associated full names of these industry standards organizations.

Section 2.4 of appendix R defines “CRI” as Color Rendering Index as defined in 10 CFR 430.2. In the June 2021 NOPR, DOE proposed to remove the definition for “CRI,” which only references the definitions in 10 CFR 430.2. Further, in the June 2021 NOPR, DOE incorrectly proposed to remove the definition of “CCT” in appendix R. However, the definition of “CCT” does not appear in appendix R. 86 FR 29888, 29899.

Section 2.1 of appendix R specifies that to the extent that definitions in the referenced IESNA and CIE standards do not conflict with the DOE definitions, the definitions specified in Section 3.0 of IES LM-9, Section 3.0 of IESNA LM-20, section 3.0 and the Glossary of IES LM-45, Section 2 of IESNA LM-58, and Appendix 1 of CIE 13.3 shall be included. In the June 2021 NOPR, DOE proposed to update the section reference from Section 2 of IES LM-58 to the corresponding Section 3 of IES LM-58-20 (which DOE proposed to incorporate by reference) and to delete the reference to the

Glossary of IES LM-45, as it no longer exists in the updated 2020 version (which DOE proposed to incorporate by reference). 86 FR 29888, 29899.

NEMA agreed with DOE's proposals to modify these definitions. (NEMA, No. 12 at p. 3) No other comments were received on the proposed amendments regarding definitions.

For the reasons discussed in the preceding paragraphs and in the June 2021 NOPR, in this final rule DOE is adopting these revisions to definitions as proposed in the June 2021 NOPR.

2. General Instructions

In the June 2021 NOPR, DOE proposed to add a "General Instructions" section to appendix R to improve the readability of and streamline the test methods in appendix R. This section would specify test practices applicable to all lamps covered by appendix R. Specifically, to ensure consistency in measurements, DOE proposed to include in the "General Instructions" section the following specifications: (1) where there is a conflict, the language of the test procedure in this appendix takes precedence over any materials incorporated by reference; (2) maintain lamp operating orientation throughout seasoning and testing, including storage and handling between tests; (3) if a lamp breaks, becomes defective, fails to stabilize, exhibits abnormal behavior (such as swirling),³² or stops producing light prior to the end of the seasoning period, replace the lamp with a new unit; however, if a lamp exhibits one of the conditions listed in the previous sentence only after the seasoning period ends, include the lamp's measurements in the sample; and (4) operate GSILs and IRLs at the rated voltage for incandescent lamps as defined in 10 CFR 430.2. 86 FR 29888, 29899. DOE tentatively concluded that these proposals only explicitly state best practices already being followed by labs for testing lamps, and would

³² This term refers to the visual observation that a beam or line of light appears to be "swirling" or "spiraling" within a fluorescent tube lamp.

not change current requirements of the DOE test procedure. 86 FR 29888, 29899 – 29900.

In particular, the proposed specification to operate GSILs and IRLs at the rated voltage for incandescent lamps as defined in 10 CFR 430.2 would maintain consistency with the current specifications for determining the test voltage of incandescent lamps as specified in the definition of “rated voltage with respect to incandescent lamps” in 10 CFR 430.2. DOE proposed to move this voltage specification currently codified as part of the definition in 10 CFR 430.2 to the “General Instructions” section of appendix R to make explicit that the specification applies to GSIL and IRL test methods in appendix R. 86 FR 29888, 29900.

DOE did not receive any comments on the proposed specifications regarding lamp breakage. For the reasons discussed in the preceding paragraphs and in the June 2021 NOPR, in this final rule DOE adopts the proposed general instructions regarding lamp breakage.

DOE received several comments on the remaining proposed general instructions specifications. NEMA supported adding general instructions in appendix R but recommended certain revisions to the proposed text. In the case of conflicting requirements, NEMA suggested that industry and DOE work mutually to resolve conflicts between referenced industry standards and appendix R rather than allow appendix R to take precedence. (NEMA, No. 12 at pp. 3-4)

By requiring that appendix R shall take precedence when there are conflicts between it and referenced industry standards, DOE ensures that all testing is conducted using a consistent methodology and not a case-by-case approach. Further, most instructions in appendix R currently reference industry standards, with the exception of DOE’s instructions for addressing lamps without industry standard data sheets and recording measured values.

For the reasons discussed in the preceding paragraphs and in the June 2021 NOPR, in this final rule DOE adopts the proposed provision in the June 2021 NOPR that appendix R shall take precedence over industry standards in the event of conflicting requirements.

In regard to lamp orientation, NEMA recommended that lamp orientation be maintained during storage and handling only if it is practical, rather than always be maintained as proposed by DOE. NEMA referenced IES LM-54, which states that maintaining orientation through storage and handling is recommended but not required. In addition, NEMA stated that instruction should be added that for 4-foot T5 miniature bipin standard and high output lamps, the procedure in Section 6.2.2 of IES LM-9-20 should be followed. This section specifies that these lamp types must be seasoned in the vertical orientation but measured horizontally. (NEMA, No. 12 at pp. 3-4)

DOE notes that Section 6.1.1 of IES LM-54-20 states that for fluorescent lamps, maintaining the orientation during seasoning when handling, transporting, or storing the lamps can reduce lamp stabilization time, and that this practice is generally not required but is effective and recommended. DOE notes that Section 6.1 of IES LM-9-20 specifies for 4-foot T5 miniature bipin standard and high output lamps an exception to the rule of maintaining lamp orientation during seasoning and testing and references Section 6.2.2 of IES LM-9-20, which specifies that they be seasoned in the vertical position and measured in the horizontal position. DOE also notes that Section 6.2.4 of IES LM-9-20 states that when transferring lamps, the pin connections and orientation used during warm-up should be maintained.

To incorporate the recommended and required specifications in industry standards, in this final rule, DOE is specifying in the General Instructions that (1) lamp operating orientation should be maintained throughout seasoning and testing, except for T5 miniature bipin standard and high output GSFLs, which should follow Section 6.2.2

of IES LM-9-20; (2) for all GSFLs, lamp orientation must be maintained when transferring lamps from a warm-up position to the photometric equipment per Section 6.2.4 of IES LM-9-20; and (3) lamp orientation must be maintained at all other times, if practical.

Regarding the proposed instructions for rated voltage, the CA IOUs commented that the current DOE test procedures requiring that GSILs and IRLs be tested at the marked voltage could result in exemption of certain lamps from standards and thereby, reduced energy savings. The CA IOUs stated that the current definitions for GSILs encompass lamps that operate between 110 and 130 V with a minimum light output of 310 lumens; therefore, a GSIL rated at 100 V may produce less than 310 lumens when tested and thus not be subject to regulation, even though it could produce greater than 310 lumens when operated at the more common 120 V. The CA IOUs cited concerns expressed by the Appliance Standards Awareness Project (“ASAP”) that manufacturers may re-rate medium-screw base incandescent lamps at voltages lower than they are operated in common use, yielding results not representative of actual performance for the majority of consumers. Hence, the CA IOUs recommended that DOE test procedures for GSILs and IRLs should require all medium base lamps to be tested at either 120 or 240 V. (CA IOUs, No. 13 at pp. 2-3)

As noted in the June 2021 NOPR, DOE did not propose to change the test voltage requirements for GSILs and IRLs. 86 FR 29888, 29900. For IRLs, modifying the test voltage requirements would change the rated voltage for certain IRLs and potentially exclude them from the definition of IRL, which is defined as having a rated voltage or voltage range that lies at least partially in the range of 115 and 130 V. 10 CFR 430.2. Further, because energy conservation standards are in part determined by the rated voltage of the IRL, changes to rated voltage may subject lamps to different standards. Regarding GSILs, DOE’s review of the market has shown that even with the current test

voltage requirements, GSILs are predominantly rated at 120 V. Hence, DOE does not find that manufacturers are re-rating voltages of GSILs to be excluded from regulation. Therefore, in this final rule, DOE is maintaining the current specifications for determining the test voltage of incandescent lamps as specified in the definition of “rated voltage with respect to incandescent lamps” in 10 CFR 430.2.

3. Test Method for Determining Initial Lamp Efficacy, CRI, and CCT

In this final rule, as proposed in the June 2021 NOPR, DOE is establishing a section called “Test Method for Determining Initial Input Power, Initial Lumen Output, Initial Lamp Efficacy, CRI, and CCT” and including existing sections regarding these measurements as subsections. DOE also proposed changes to test conditions, setup, methods, measurements and calculations that are detailed in the sections below. 86 FR 29888, 29900.

a. Test Conditions and Setup

In the June 2021 NOPR, for clarity, DOE proposed to include the term “setup” in the title of “Test Conditions” (*i.e.*, “Test Conditions and Setup”) and modify the existing language to use the phrase “establish ambient, physical, and electrical conditions” consistently. Additionally, for GSFLs, DOE proposed to move the specifications regarding appropriate voltage and current conditions and reference ballast settings from the “Test Methods and Measurements” section to “Test Conditions and Setup,” as these requirements are part of the electrical conditions and setup that must be met prior to taking any measurements. 86 FR 29888, 29900. DOE received no comments regarding these modifications. For the reasons discussed in the June 2021 NOPR, DOE is adopting these proposed changes in this final rule.

Further, in the June 2021 NOPR, DOE proposed to specify that when operating at low frequency, cathode power must be included in the measurement if ANSI C78.81 or ANSI C78.901 classifies the circuit application as “rapid start” for that GSFL lamp type.

86 FR 29888, 29901. If these industry test standards classify the circuit application as something other than “rapid start,” DOE proposed that cathode power should not be included. *Id.* DOE also proposed to specify that cathode power must not be included in measurements when operating at high frequency. *Id.*

Additionally, for GSFL lamp types that do not have lamp data sheets listed in industry test standards, section 4.1.2 of appendix R provides reference ballast settings with which to test. In the June 2021 NOPR, DOE proposed to add to the specified reference ballast settings instructions on whether the lamp must be tested at low or high frequency or include cathode power (*see* Table III.2 of this document). 86 FR 29888, 29900-29901. DOE’s proposal was intended to base the newly established instructions on how the lamp types most similar to the lamp type not contained in the industry test standard are tested. 86 FR 29888, 29901.

Table III.2 Proposed Frequency and Cathode Power Test Specifications for GSFLs in the June 2021 NOPR³³

Lamp Type	Test Frequency	Test with Cathode Power?
4-foot medium bipin (T8, T10, T12)	Low	Yes
2-foot U-shaped (T8 and T12)	Low	Yes
8-foot slimline (T8 and T12)	Low	No
8-foot high output (T12)	Low	Yes
8-foot high output (T8)	High	No
4-foot medium bipin standard output and high output (T5)	High	No

As indicated by Table III.2 of this document, DOE’s proposed instructions provided cathode power and frequency operation instructions by lamp length, base, and diameter for GSFL types lacking ANSI data sheets.

NEMA, in its comments, suggested revisions to the proposed instructions in Table III.2 of this document. NEMA suggested adding lamp wattage as a determining factor. Specifically, NEMA requested the following changes: (1) 4-foot medium bipin (“MBP”)

³³ 86 FR 29888, 29901.

T8 lamps greater than or equal to 25 W, but less than 32 W, tested at low frequency should be tested without cathode power rather than with cathode power as proposed; (2) 2-foot U-shaped T8 lamps greater than or equal to 25 W, but less than 31 W, tested at low frequency should be tested without cathode power rather than with cathode power as proposed. NEMA also recommended that DOE's instructions in Table III.2 of this document apply to wattages greater than or equal to 49 W for the 8-foot slimline single pin ("SP") T8 and T12 lamps. NEMA stated that its changes were based on the most similar lamp type in the industry test standard. (NEMA, No. 12 at pp. 2-3)

As noted, in proposing the test frequency and cathode power specifications for a lamp that does not have a lamp data sheet in industry standards, DOE used the lamp data sheet of a lamp type most similar to the lamp without a lamp data sheet. NEMA commented that it used the same approach in recommending revisions to DOE's proposals. Based on this comment, DOE assumes that NEMA's recommendation that 4-foot MBP T8 and 2-foot U-shaped T8 lamps, respectively less than 32 W and 31 W, be tested without cathode power is based on lamp datasheets for reduced wattage (*i.e.*, 25 W, 28 W, 30 W) 4-foot MBP lamp types in ANSI C78.81-2010. Reduced wattage 4-foot MBP lamp types have lamp datasheets that specify an instant start/program start circuit and provide specifications for testing at low frequency either with or without cathode power. NEMA indicates that manufacturers are choosing to test these lamps without cathode power. (NEMA, No. 12 at pp. 2-3) To use the proxy lamp data sheet that most accurately reflects the lamp without a data sheet and to reflect how manufacturers are using the specifications in the lamp data sheet, in this final rule, DOE adopts NEMA's suggested revisions to test these 4-foot MBP T8 and 2-foot U-shaped T8 lamps without cathode power. Additionally, because the circuit design may not be apparent (*i.e.*, rapid/instant/program start marked on the lamp) for a lamp without a lamp data sheet, DOE agrees to use wattage to identify the lamps that should not be tested with cathode

power for these 4-foot MBP T8 and 2-foot U-shaped T8 lamps. DOE has amended the table provided in the June 2021 NOPR to reflect this change (see Table III.3 of this document).

In its comments, NEMA also recommended that DOE's instruction regarding test frequency and cathode power should be limited to lamps with certain wattages (*i.e.*, 4-foot MBP lamps and 2-foot U-shaped lamps greater than or equal to 25 W and 8-foot SP slimline lamps greater than or equal to 49 W). (NEMA, No. 12 at pp. 2-3) This suggested change would capture some but not all of the lamps covered under the definition of "fluorescent lamp."³⁴ DOE's proposed instructions for addressing lamp types that are not included in ANSI C78.81 or ANSI C78.901 lamp data sheets are to address all lamp types and wattages, including lamps that may be introduced by a manufacturer in the future and/or may become the subject of standards. Hence, DOE is not including NEMA's suggested wattage limitations in this final rule.

Finally, NEMA commented that the label in Table III.2 of this document for the 4-foot T5 standard and high output lamp type should be "miniature bipin ("MiniBP")" rather than "MBP." (NEMA, No. 12 at pp. 2-3) DOE agrees that the base type for the 4-foot T5 standard and high output lamps was mislabeled in Table III.2 of the June 2021 NOPR and should be MiniBP rather than MBP (see Table III.3 for correction).

Table III.3 summarizes the revised frequency and cathode power test specifications for GSFLs adopted in this final rule.

³⁴ "Fluorescent lamp" is defined as a low pressure mercury electric-discharge source in which a fluorescing coating transforms some of the ultraviolet energy generated by the mercury discharge into light, including only the following: (1) Any straight-shaped lamp (commonly referred to as 4-foot medium bipin lamps) with medium bipin bases of nominal overall length of 48 inches and rated wattage of 25 or more; (2) Any U-shaped lamp (commonly referred to as 2-foot U-shaped lamps) with medium bipin bases of nominal overall length between 22 and 25 inches and rated wattage of 25 or more; (3) Any rapid start lamp (commonly referred to as 8-foot high output lamps) with recessed double contact bases of nominal overall length of 96 inches; (4) Any instant start lamp (commonly referred to as 8-foot slimline lamps) with single pin bases of nominal overall length of 96 inches and rated wattage of 49 or more; (5) Any straight-shaped lamp (commonly referred to as 4-foot miniature bipin standard output lamps) with miniature bipin bases of nominal overall length between 45 and 48 inches and rated wattage of 25 or more; and (6) Any straight-shaped lamp (commonly referred to 4-foot miniature bipin high output lamps) with miniature bipin bases of nominal overall length between 45 and 48 inches and rated wattage of 44 or more. 10 CFR 430.2.

Table III.3 Frequency and Cathode Power Test Specifications for GSFLs Adopted in this Final Rule

Lamp Type	Test Frequency	Test with Cathode Power?
4-foot medium bipin (T8, T10, T12)		
T10, T12, T8 \geq 32 W	Low	Yes
T8 < 32 W	Low	No
2-foot U-shaped (T8 and T12)		
T12, T8 \geq 31 W	Low	Yes
T8 < 31 W	Low	No
8-foot slimline (T8 and T12)	Low	No
8-foot high output (T12)	Low	Yes
8-foot high output (T8)	High	No
4-foot miniature bipin standard output and high output (T5)	High	No

Appendix R currently references IES LM-9, IES LM-45, and IES LM-20 in their entirety for test conditions. In the June 2021 NOPR, DOE proposed to specify the relevant sections of the industry test standards; specifically, that ambient, physical, and electrical conditions be established as described in Sections 4.0, 5.0, 6.1, 6.5 and 6.6 of IES LM-9 for GSFLs; Sections 4.0, 5.0, 6.1, 6.3 and 6.4 of IES LM-45 for GSILs; and Sections 4.0 and 5.0 of IES LM-20 for IRLs. 86 FR 29888, 29901.

In its comments, NEMA agreed with the proposed references to the specified sections of IES LM-9, IES LM-45, and IES LM-20 for establishing ambient, physical, and electrical conditions, as well as seasoning and stabilization. (NEMA, No. 12 at p. 4) For the reasons discussed in the June 2021 NOPR and in the preceding paragraphs, in this final rule DOE adopts the proposed amendments to test conditions and setup in appendix R.

b. Test Methods, Measurements, and Calculations

Section 3.1 of appendix R specifies that for GSFLs, the ambient conditions of the test and the electrical circuits, reference ballasts, stabilization requirements, instruments, detectors, and photometric test procedure and test report shall be as described in the relevant sections of IES LM-9. Section 3.2 of appendix R specifies that for GSILs, the selection and seasoning (initial burn-in) of the test lamps, the equipment and instrumentation, and the test conditions shall be as described in IES LM-45. Section 3.3

of appendix R specifies that for IRLs, the selection and seasoning (initial burn-in) of the test lamps, the equipment and instrumentation, and the test conditions shall conform to Sections 4.2 and 5.0 of IESNA LM-20.

In the June 2021 NOPR, DOE proposed to replace these references of industry test standards in general to list specific sections of the industry standard. 86 FR 29888, 29901. The proposed section references as well as proposed changes to seasoning, stabilization, initial power and initial lumen output measurements, and certain calculations are detailed in the sections which follow.

Seasoning and Stabilization

In the June 2021 NOPR, DOE proposed to state explicitly that lamps must be seasoned and stabilized according to Section 6.2 of IES LM-45 for GSILs and Section 6.0 of IES LM-20 for IRLs. 86 FR 29888, 29901. For GSFLs, DOE proposed to state that lamps must be seasoned and stabilized in accordance with Sections 6.1, 6.2, 6.3, and 6.4 of IES LM-9. 86 FR 29888, 29902. DOE tentatively determined that the proposed updates would only specify more exact industry reference to current specifications and would not change current requirements of the DOE test procedure. 86 FR 29888, 29901, 29902. DOE received no comments on the proposed changes. For the reasons discussed in the June 2021 NOPR and in the preceding paragraphs, DOE is adopting the proposed amendments regarding references for seasoning and stabilization.

Photometric Measurements

DOE proposed to specify that initial lumen output measurements be taken in accordance with Section 7.0 in IES LM-9 for GSFLs, Section 7.0 in IES LM-45 for GSILs, and Section 7.0 or 8.0 in IES LM-20 for IRLs. 86 FR 29888, 29902. DOE tentatively determined that these section references would not limit manufacturers from using one specific method for taking photometric measurements (*i.e.*, goniophotometer, integrating sphere). *Id.* Additionally, for IRLs, DOE proposed to require measuring initial lumen output rather than total forward lumens. *Id.* DOE tentatively found that,

because a reflector lamp is designed to focus lumens in a specific direction rather than in all directions, the term “total forward lumens” has the same meaning as “initial lumen output.” *Id.*

Regarding photometric measurements and DOE’s proposal to continue to allow multiple methods for taking photometric measurements, the CA IOUs reiterated its comment submitted in response to the August 2017 RFI in which the CA IOUs expressed support for the exclusive use of the integrating sphere method for measuring the light output of GSFLs, IRLs, and GSILs. The CA IOUs stated that they understand that while there are aspects of lamp performance (such as color rendering), reliability, and standby energy consumption that are technology-specific, not requiring exclusive use of the integrating sphere method was a missed opportunity to set a technology-neutral test method. In addition, the CA IOUs expressed support for DOE’s proposal to measure initial lumens rather than total forward lumens for IRLs. (CA IOUs, No. 13 at p. 2)

For this final rule, DOE reviewed whether to require exclusive use of the integrating sphere method and came to the same conclusion as in the June 2021 NOPR that both the goniophotometer and integrating sphere method should be allowed for measurement, as this may provide logistical flexibility for manufacturers. Additionally, the integrating sphere and goniophotometer methods can be used across lamp technologies. Therefore, DOE continues to allow the use of both the goniophotometer and integrating sphere methods. In this final rule, for the reasons discussed in the June 2021 NOPR and in the preceding paragraphs, DOE is adopting the industry standard section references for photometric measurements and changing the term “total forward lumens” to “initial lumen output” for IRLs in appendix R as proposed in the June 2021 NOPR.

Determining CRI and CCT

Manufacturers of GSILs are required to certify CRI values (*see* 10 CFR 429.27(b)(2)(iii)), and DOE's standards for GSILs include a minimum CRI requirement (*see* 10 CFR 430.32(x)(1)(iii)(A) and (B)). In addition, the Energy Independence and Security Act of 2007 ("EISA;" Pub. L. 110-140) established a CRI requirement for IRLs.³⁵ Section 4.4 of appendix R provides specifications for determining CRI for GSFLs, but does not address determining CRI for either GSILs or IRLs.

In the June 2021 NOPR, DOE proposed to include a test method for determining CRI of GSILs and IRLs in appendix R. 86 FR 29888, 29902. Specifically, DOE proposed to require that CRI of GSILs be determined in accordance with Section 7.4 of IES LM-45 and CIE 13.3 and that CRI of IRLs be determined in accordance with CIE 13.3. *Id.* Additionally, regarding GSFLs, for completeness, DOE proposed to state that, in addition to CIE 13.3, the CRI of GSFLs be determined in accordance with Section 7.6 of IES LM-9. *Id.* Because CIE 13.3 is the industry test standard for testing CRI of all lamps, DOE tentatively found that CRI is likely already being measured in accordance with this standard, and therefore, tentatively concluded that the proposed test method for CRI would establish procedures already being followed. *Id.*

Currently, appendix R requires CCT for GSFLs to be determined in accordance with IES LM-9, and CCT for incandescent lamps to be determined in accordance with CIE 15. In the June 2021 NOPR, DOE proposed to require that CCT of GSFLs be determined in accordance with Section 7.6 of IES LM-9 and CIE 15; CCT of GSILs be determined in accordance with Section 7.4 of IES LM-45 and CIE 15; and CCT of IRLs be determined in accordance with CIE 15. 86 FR 29888, 29902.

³⁵ Section 321(a) of the Energy Independence and Security Act of 2007 ("EISA 2007") established CRI requirements for lamps that are intended for a general service or general illumination application (whether incandescent or not); have a medium screw base or any other screw base not defined in ANSI C81.61-2006; are capable of being operated at a voltage at least partially within the range of 110 to 130 volts; and are manufactured or imported after December 31, 2011.

In its comments, NEMA agreed with the proposed industry test standard references for measuring CCT and CRI. (NEMA, No. 12 at p. 4) For the reasons discussed in the June 2021 NOPR and in the preceding paragraphs, DOE adopts the industry standard section references for the measurement of CRI and CCT as proposed in the June 2021 NOPR.

4. Test Methods, Measurements, and Calculations for Determining Time to Failure

In the June 2021 NOPR, to improve the organization of appendix R, DOE proposed to create a section called “Test Method for Determining Time to Failure for General Service Incandescent Lamps and Incandescent Reflector Lamps” and subsections, “Test Conditions and Setup,” and “Test Methods, Measurements, and Calculations.” 86 FR 29888, 29903. To clarify the existing test method for determining the time to failure of GSILs and adopt the same test method for determining time to failure of IRLs, DOE proposed to include information on test conditions, seasoning and stabilization, and to remove information not pertinent to determining the time to failure value of the lamp. *Id.* Specifically, DOE proposed to measure lifetime of IRLs in accordance with IES LM-49 and use the same methods as for GSIL lifetime testing. *Id.* To specify the ambient, physical, and electrical conditions for lifetime testing of GSILs and IRLs, DOE proposed to reference Sections 4.0 and 5.0 of IES LM-49. DOE also proposed to specify that the lamps must be seasoned and stabilized and to reference Section 6.2 of IES LM-45 for these procedures. *Id.* Further, DOE proposed to require measuring “time to failure” in accordance with Section 6.0 of IES LM-49 (see section III.C.1 for definition). *Id.* Additionally, DOE proposed to update the existing reference from Section 6.1 of IES LM-49-01 to corresponding Section 6.4 of IES LM-49-20 in the provision disallowing accelerated testing. *Id.* Finally, because it relates to the standard rather than the test procedure, DOE proposed to remove language in section 4.2.3 of appendix R stating that the lamp will be deemed to meet minimum rated lifetime

standards if greater than 50 percent of the sample size meets the minimum rated lifetime.

Id.

DOE tentatively determined that these proposed updates would not change current requirements for testing lifetime of GSILs, as the updates only explicitly state certain steps of the referenced industry standard for determining time to failure for incandescent lamps and provide the associated section references to an industry test standard already incorporated by reference. *Id.* DOE also tentatively determined that because the proposed requirements for testing lifetime of IRLs reference IES LM-49, the industry standard for testing lifetime of incandescent lamps, they are not substantively different from those manufacturers are currently using to conduct this test. *Id.*

In its comments, NEMA agreed with DOE's proposed section references in IES LM-49 for establishing ambient, physical, and electrical conditions and measuring time to failure, as well as proposed section references in IES LM-45 for seasoning and stabilization. (NEMA, No. 12 at p. 4) DOE received no other comments on its proposals regarding test methods, measurements, and calculations for determining time to failure. For the reasons discussed in the June 2021 NOPR and in the preceding paragraphs, DOE adopts the updates to the organization of test procedure provisions and to the method of determining time to failure as proposed in the June 2021 NOPR.

D. Amendments to 10 CFR 429.27, 10 CFR 429.33 and 10 CFR 430.2

Sampling, certification, and rounding requirements for GSFLs, IRLs, and GSILs are currently specified in 10 CFR 429.27. In this final rule, as proposed in the June 2021 NOPR (*see* 86 FR 29888, 29903), DOE is reorganizing 10 CFR 429.27 to apply only to GSFLs (as opposed to GSFLs, GSILs, and IRLs), establishing new §429.55³⁶ for IRLs, and establishing new §429.66 for GSILs, so that each lamp type (*i.e.*, GSFL, IRL, GSIL)

³⁶ In the June 2021 NOPR, DOE had proposed establishing 10 CFR 429.38 for IRLs. Subsequent to publishing the June 2021 NOPR, DOE has reserved 10 CFR 429.38 for non-class A external power supplies.

has its own section within 10 CFR part 429. Accordingly, as proposed (*see* 86 FR 29888, 29903), DOE is also revising 10 CFR 429.33 to replace references to 10 CFR 429.27 with references to the specific, separate sections for each lamp type. DOE has determined that the updates to 10 CFR 429.27, 10 CFR 429.33 and 10 CFR 430.2 are not substantive changes, improve the clarity of the sampling, certification, and rounding requirements for GSFLs, IRLs, and GSILs, and thereby will not affect measured values. DOE details these amendments in the following subsections.

1. Definitions

Basic model

In the June 2021 NOPR, DOE proposed, for clarity, to update the definition of “basic model” in 10 CFR 430.2 to replace “lumens per watt (lm/W)” with “lamp efficacy.” 86 FR 29888, 29903. DOE tentatively determined that this change would improve clarity by using the name of the metric instead of the unit of measure. DOE received no comments on the proposed change. *Id.* In this final rule DOE is adopting the proposed modification to the definition of “basic model.”

Definitions and References to “Rated”

In the June 2021 NOPR, DOE proposed to replace references to “rated lumen output” and “rated lifetime” in 10 CFR 429.27 with, respectively, “initial lumen output” and “lifetime.” 86 FR 29888, 29904. DOE stated that the term “rated” can lead to misunderstanding to the extent a reader interprets it as a standardized value rather than one that is determined through measurements. *Id.*

In its comments, NEMA agreed with the proposed replacements of “rated lumen output” and “rated lifetime.” (NEMA, No. 12 at p. 5) For the reasons discussed in the June 2021 NOPR and in the preceding paragraphs, DOE is replacing the references of “rated lumen output” and “rated lifetime” in 10 CFR 429.27 with, respectively, “initial lumen output” and “lifetime” as proposed in the June 2021 NOPR.

“Rated wattage” for GSILs, IRLs, and GSFLs (without a lamp datasheet) is defined in 10 CFR 430.2 as the electrical power measured according to appendix R. In the June 2021 NOPR, DOE proposed to clarify this definition by replacing the references to appendix R with references to the relevant sections in 10 CFR part 429 and replacing “electrical power” with “initial input power.” 86 FR 29888, 29904. The resulting modification provided clearer directions for determining rated wattage by specifying that the rated wattage is the represented value of electrical power as determined in the appropriate 10 CFR part 429 section derived from the initial input power measured in appendix R.

In 10 CFR 430.2, the term “rated lifetime for general service incandescent lamps” means the length of operating time of a sample of lamps (as defined in 10 CFR 429.27(a)(2)(iv)) between first use and failure of 50 percent of the sample size in accordance with test procedures described in IESNA LM-49, as determined in section 4.2 of appendix R. The operating time is based on the middle lamp operating time for an odd number of samples and the average operating time of the two middle lamps for an even number of samples. *See* 10 CFR 430.2. Instructions for determining the length of operating time using middle samples are specified in the relevant sections at 10 CFR part 429.

In the June 2021 NOPR, DOE proposed to replace the term “rated lifetime for general service incandescent lamps” with the term “lifetime.” With respect to an incandescent lamp, this would mean the length of operating time between first use and failure of 50 percent of the sample units (as specified in 10 CFR 429.27 and 10 CFR 429.38), determined in accordance with the test procedures described in appendix R. In proposing this definition for the term “lifetime”, DOE proposed to remove the term “rated” from the current term “rated lifetime for general service incandescent lamps” to maintain consistency with DOE’s proposal to remove the term “rated” from instances of

“rated lifetime” in the relevant sections of 10 CFR 429.27. Additionally, because the term “lifetime” rather than “lifetime for general service incandescent lamps” is used in 10 CFR 429.27, DOE also proposed to remove the phrasing “for general service incandescent lamps” from the defined term. *Id.*

In its comments, NEMA agreed with the proposed modifications to definitions for “lifetime” and “rated wattage.” (NEMA, No. 12 at p. 5) For the reasons discussed in the June 2021 NOPR and in the preceding paragraphs, DOE is making clarifying amendments to the definitions of “rated wattage” and “lifetime for general service incandescent lamp” and changing the latter term to “lifetime” as proposed in the June 2021 NOPR.

In the provisions for determining the represented value of rated wattage for GSFLs, GSILs, and IRLs, in the June 2021 NOPR, DOE proposed to change any current references of “rated lamp wattage” to “rated wattage” for consistency within 10 CFR part 429 and to conform to the relevant term used in the energy conservation standards in 10 CFR 430.32. 86 FR 29888, 29904. DOE received no comments on the proposed change. In this final rule, as proposed in the June 2021 NOPR, DOE is amending “rated lamp wattage” to “rated wattage.”

In the June 2021 NOPR, in the provisions for determining the rated wattage of GSILs, DOE proposed to change from using a two-tailed confidence interval to a one-tailed confidence interval when determining the 95-percent upper confidence limit. 86 FR 29888, 29904. A two-tailed confidence interval test is typically utilized to determine whether a set of results could be either higher or lower, while a one-tailed confidence interval test is typically utilized to determine whether a set of results are going in one specific direction (*i.e.*, either higher or lower). All represented values of lamp metrics required by DOE are either the greater of or lower of the mean or the upper/lower confidence limit of the results—depending on how the consumer may value that metric.

(For example, where lower values are favored, such as wattage, the represented value is greater of the mean or upper confidence limit of the results). A represented value of rated wattage for a GSIL is the greater of the mean or the upper 95-percent confidence limit. 10 CFR 429.27(a)(2)(iii) Because DOE is interested in the greater value from the tested results for wattage, a one-tailed confidence interval (which indicates whether results are going higher or lower), rather than two-tailed confidence interval test is appropriate.

In its comments, NEMA agreed with the proposal to base the 95 percent upper confidence limit for input power on the one-tailed confidence interval. (NEMA, No. 12 at p. 5) For the reasons discussed in the June 2021 NOPR and in the preceding paragraphs, DOE adopts a one-tailed confidence interval to determine the 95-percent upper confidence limit as proposed in the June 2021 NOPR.

Definitions of IRL types

In the June 2021 NOPR, DOE proposed to update the definitions in 10 CFR 430.2 for the bulged parabolic aluminized reflector (“BPAR”), 20/8-inch reflector (“R20”), elliptical reflector (“ER”), and bulged reflector (“BR”) incandescent reflector lamps with references to the latest versions of the currently referenced industry standards. 86 FR 29888, 29904. Additionally, DOE proposed definitions for reflector (“R”) and parabolic aluminized reflector (“PAR”) incandescent reflector lamps that reference ANSI C78.21-2011 (R2016). *Id.* Accordingly, DOE proposed to incorporate by reference ANSI C78.21-2011 (R2016) and ANSI C78.79-2014 (R2020) for 10 CFR 430.2. *Id.* DOE received no comments on the proposed changes. In this final rule, DOE adopts the amendments to definitions of IRL types as proposed in the June 2021 NOPR. DOE notes that, as specified in the proposed rule language, the definitions of “R” and “PAR” reference ANSI C78.79-2014 (R2020), not ANSI C78.21-2011 (R2016) as incorrectly stated in the section titled “Definition of IRL Types” in the preamble of the June 2021 NOPR. 86 FR 29888, 2990. Additionally, DOE removes the duplicate definition of the

term “BR incandescent reflector lamp” in 10 CFR 430.2 and retains the definition of this term as proposed in the June 2021 NOPR. This amendment is consistent with the statutory definition of “BR incandescent reflector lamp” in 42 U.S.C. 6291(55) and does not impact the scope of coverage for DOE’s test procedure or energy conservation standards.

2. Sampling Requirements

In the June 2021 NOPR, DOE proposed certain clarifying and organizational modifications to the sampling provisions in 10 CFR 429.27(a). 86 FR 29888, 29904. First, to be consistent with sampling requirement language for other lamp types (*i.e.*, CFLs and integrated LED lamps), DOE proposed to state explicitly that represented values and certified ratings must be determined in accordance with the sampling provisions described in 10 CFR part 429. *Id.* DOE also proposed to specify the same sample of units as the basis for representations for all metrics for each basic model. *Id.*

Further, in the June 2021 NOPR, to reduce burden and confusion, DOE proposed to change the minimum sample size from 21 lamps to 10 lamps and to remove the requirement that a minimum of three lamps be selected from each month of production for a minimum of 7 out of a 12-month period. *Id.* Reducing the sample size from 21 to 10 lamps aligns with the sampling requirements of other lighting products (*e.g.*, CFLs, integrated LED lamps). DOE proposed to remove the minimum of 7 out of 12 months requirement because it has led to confusion among manufacturers who interpreted this to mean that DOE requires re-testing every calendar year. Further, selecting a few sample units from multiple months of the year can be difficult to coordinate and execute. In particular, if a manufacturer does not initially know the number of months in which it will produce the basic model, it would need to reserve lamps from each production month and later decide how many to test. 86 FR 29888, 29904 – 29905.

DOE also proposed to eliminate the requirement to identify the production months of sample units in 10 CFR 429.27(c) by providing the production date codes and accompanying decoding schemes for all test units. *Id.* DOE tentatively concluded that this change would not require manufacturers to retest products. *Id.* Certifications based on 21 lamps would meet the proposed requirement to base certification on a minimum of 10 units. However, manufacturers would likely choose to test fewer lamps when they certify new products and therefore save testing costs.

In its comments, NEMA agreed with the proposed reduction in minimum sample size from 21 to 10, stating that GSFLs, IRLs, and GSILs are legacy technologies with less frequent production runs, making flexibility in sampling beneficial. NEMA also commented that DOE should consider sample size reductions in other product categories where sample size and testing cost can be non-trivial. (NEMA, No. 12 at p. 5)

In response to NEMA's comment to reduce the sample size for other products generally, DOE notes that it is outside the scope of this rulemaking, which relates only to the test procedures and associated sampling and certification requirements for GSFLs, IRLs, and GSILs.

In this final rule, as proposed in the June 2021 NOPR, DOE is reducing the minimum sample size from 21 to 10 for GSFLs, IRLs, and GSILs, and removing the associated requirement that a minimum of three lamps be selected from each month of production for a minimum of 7 months out of a 12-month period. Also, as proposed in the June 2021 NOPR, DOE is specifying that the same sample of units be used as the basis for representations for all metrics for each basic model. Additionally, as proposed in the June 2021 NOPR, DOE is explicitly stating that represented values and certified ratings must be determined in accordance with the sampling provisions described in 10 CFR part 429. The expected cost savings from this adopted change are described in section III.G of this document.

Because sample units would no longer have to be selected over a 12-month period, DOE also proposed in the June 2021 NOPR to remove the requirement in 10 CFR 429.12(e)(2) to submit an initial certification report prior to or concurrent with the distribution of a new basic model for GSFLs and IRLs. 86 FR 29888, 29905. Instead, for GSFLs and IRLs, the complete certification report described in 10 CFR 429.12(b) would be required at that time. *Id.* DOE stated that it expected a manufacturer would complete the testing needed to submit a certification of compliance with standards prior to distribution in commerce, so a subsequent report would not be needed to reflect additional test results. *Id.*

In its comments, NEMA agreed with the removal of initial certification report submissions for GSFLs and IRLs and noted that no new product offerings are expected that would require said reports. (NEMA, No. 12 at p. 6) In this final rule, DOE adopts its proposal in the June 2021 NOPR to remove initial certification report submissions for GSFLs and IRLs and to require that a complete test report be submitted prior to distribution in commerce of a basic model.

3. Represented Value Determinations

Under the FTC lighting facts labeling requirement, manufacturers of GSILs and IRLs are required to include on the lamp packaging basic and consistent information, including lumen output, wattage, life, CCT, and costs of annual energy consumption. 16 CFR 305.23(b). In support of FTC labeling requirements for GSILs and IRLs, in the June 2021 NOPR, DOE proposed adding determinations for the represented values of life (in years), estimated annual energy cost (in dollars per year), CCT, wattage (for IRLs only), and initial lumen output (for IRLs only). 86 FR 29888, 29905.

Specifically, DOE proposed that represented values of CCT for GSILs and IRLs, and wattage for IRLs, be determined as the mean of the sample and initial lumen output for IRLs be determined using a lower confidence limit (“LCL”) calculation. Further,

DOE proposed that represented values of life (in years) for GSILs and IRLs be determined by dividing the represented lifetime of these lamps, as determined by DOE requirements in 10 CFR part 429, by the estimated annual operating hours as specified by FTC in 16 CFR 305.23(b)(3)(iii). To support this calculation, DOE proposed that the lifetime for IRLs be determined as equal to or less than the median time to failure of the sample. DOE proposed that represented values of estimated annual energy cost (in dollars per year) for GSILs and IRLs be determined in accordance with FTC requirements (*i.e.*, a usage rate of 3 hours per day, and 11 cents (\$0.11) per kWh), using the average initial wattage for the tested sample of lamps (*see* 16 CFR 305.23(b)(3)(ii)). *Id.*

DOE's current test procedure for GSFLs includes measurement of wattage and CCT, and in this final rule DOE is adopting a test procedure for measuring CRI of IRLs (see section III.C.3 of this document). Therefore, in the June 2021 NOPR, DOE proposed to provide instructions that the represented values for wattage and CCT of GSFLs be determined as the mean of the sample, and CRI for IRLs be determined using a LCL calculation. *Id.*

DOE also proposed to revise existing represented value determinations of initial lumen output for GSILs from a mean (average) to an LCL calculation; and determination of CRI for GSFLs from an LCL to an average calculation. *Id.* Finally, DOE proposed to remove language stating that lifetime is the length of operating time between first use and failure of 50 percent of the sample size. *Id.* Instead, DOE proposed to directly specify how failure of 50 percent of the sample is determined by stating that the represented value of lifetime is equal to or less than the median time to failure of the sample. *Id.* For an odd sample size, the median time to failure is simply the middle unit's time to failure. For an even sample size, it is the arithmetic mean of the time to failure of the two middle samples. DOE proposed this change would apply to both GSILs and IRLs. *Id.*

DOE received no comments on these proposed changes. In this final rule, DOE adopts the aforementioned updates to determinations of represented values as proposed in the June 2021 NOPR.

4. Reporting Requirements

To align the proposed amendments with the sampling requirements (*see* section III.D.2 of this document), in the June 2021 NOPR, DOE proposed removing the requirement to report production dates of units tested and removing “12-month average” from the description for GSFLs, IRLs, and GSILs. 86 FR 29888, 29905. Further, to align with the proposed method of referencing wattage (adopted in this final rule, *see* section III.D.1 of this document), DOE proposed clarifying the description of “lamp wattage” so that it instead reads as “rated wattage” for GSFLs, IRLs, and GSILs. *Id.* Additionally, to align with the proposed method of referencing lifetime (adopted in this final rule, *see* section III.D.1), DOE proposed clarifying the description of “average minimum rated lifetime” so that it instead reads as “lifetime” for GSILs. *Id.*

DOE received no comments on these proposed changes. In this final rule, DOE adopts conforming amendments to the terminology in reporting requirements as proposed in the June 2021 NOPR.

5. Rounding Requirements

In the June 2021 NOPR, for completeness and clarity, DOE proposed to specify rounding requirements for all represented values. 86 FR 29888, 29906. DOE proposed to require rounding initial input power to the nearest tenth of a watt, initial lumen output to three significant digits, CRI to the nearest whole number, and lifetime to the nearest whole hour. *Id.* DOE proposed to modify the CCT rounding requirement to the nearest 100 Kelvin rather than nearest 10 Kelvin. *Id.* DOE tentatively determined that these updates to rounding requirements would align with other DOE lamp test procedures such

as CFLs and integrated LED lamps, and tentatively determined they provide the necessary level of precision for evaluating compliance with the applicable metric(s). *Id.*

Additionally, DOE proposed to move the rounding requirements for lamp efficacy and CCT from appendix R to 10 CFR part 429. *Id.* DOE also proposed to consolidate all rounding provisions in a single paragraph in each of the relevant product-specific sections in 10 CFR part 429. *Id.*

NEMA commented that it did not perceive any potential negative impact as a result of DOE's proposed rounding proposal, because it pertains to different functional parameters, and testing of GSFL, IRL, and GSIL technology is very mature and well understood. (NEMA, No. 12 at p. 5)

In this final rule, DOE adopts the aforementioned updates to rounding requirements as proposed in the June 2021 NOPR.

E. Amendments to 10 CFR 430.23(r)

Test procedures and measurements for GSFLs, IRLs, and GSILs are specified in 10 CFR 430.23(r). Because they are also established in appendix R, DOE proposed in the June 2021 NOPR to remove calculations for determining annual energy consumption, lamp efficacy, CRI, and lifetime from 10 CFR 430.23(r). 86 FR 29888, 29906.

Additionally, DOE proposed to reference appendix R in general rather than specifying sections, so that any future amendments to sections in appendix R do not require changes in 10 CFR 430.23(r). *Id.* Finally, DOE proposed to remove all references to annual energy consumption, as this metric is not required by DOE. DOE proposed to replace the current language in 10 CFR 430.23(r) with a requirement to measure initial lumen output, initial input power, initial lamp efficacy, CRI, CCT, and time to failure in accordance with appendix R. *Id.*

DOE received no comments regarding these proposed changes. DOE has determined that these changes to 10 CFR 430.23(r) improve the clarity of the GSFL, IRL,

and GSIL test procedures. In this final rule, DOE adopts the amendments to 10 CFR 430.23(r) as proposed in the June 2021 NOPR.

F. Conforming Amendments to Energy Conservation Standard Text at 10 CFR 430.32

In the June 2021 NOPR, to avoid confusion and align with the proposed new terminology for appendix R and 10 CFR 429.27, DOE proposed to modify certain terms related to the energy conservation standards for GSFLs, IRLs, and GSILs. 86 FR 29888, 29906. Specifically, the tables in 10 CFR 430.32(n)(6) and 10 CFR 430.32(x) provide the energy conservation standards for IRLs and GSILs, respectively, for which the wattage terms are measured values. For IRLs, DOE proposed to change “rated lamp wattage” to “rated wattage” in 10 CFR 430.32(n)(6). 86 FR 29888, 29906. Also, in existing footnote 1 in the table in 10 CFR 430.32(n)(6), DOE proposed to specify the “P” in the minimum standard equation as “rated wattage” rather than “rated lamp wattage.” *Id.* For GSILs, DOE proposed to change the term “maximum rate wattage” to “maximum rated wattage” in 10 CFR 430.32(x). *Id.*

Further, for GSIL standards in 10 CFR 430.32(x), in the June 2021 NOPR, DOE proposed to remove the term “rated” from “rated lumen ranges” and add an explanatory footnote to use the measured initial lumen output to determine the applicable lumen range. *Id.* Finally, DOE proposed to remove the term “rate” from “minimum rate lifetime” and add an explanatory footnote to use lifetime determined in accordance with 10 CFR 429.27 to assess compliance with this standard. *Id.*

Additionally, DOE proposed to remove the lamp efficacy requirements for GSFLs manufactured after May 1, 1994, and November 1, 1995, and on or before July 14, 2012, listed in 10 CFR 430.32(n)(1) and for IRLs manufactured after November 1, 1995, and on or before July 14, 2012, listed in 10 CFR 430.32(n)(5). *Id.* New standards superseded these standards, and there are likely no units on the market to which they apply.

Finally, DOE proposed to change the subparagraph numbering in 10 CFR 430.32(x) as follows: 10 CFR 430.32(x)(1)(iii)(A) and (B) to respectively 10 CFR 430.32(x)(2) and (3); and subsequently renumber 10 CFR 430.32(x)(2) and (3) to 10 CFR 430.32(x)(4) and (5). This would reduce any confusion that standards under these subparagraphs are applicable only for lamps that fall under 10 CFR 430.32(x)(1)(iii). *Id.*

In its comments, NEMA agreed with the proposal to align terminology. (NEMA, No. 12 at p. 5) DOE has determined that these changes to 10 CFR 430.32 improve the clarity of the GSFL, IRL, and GSIL test procedures. As these changes are conforming amendments that generally align the terminology used in the energy conservation standards and test procedures, these amendments will not impact the stringency of the required energy conservation standard or compliance with the applicable energy conservation standards. In this final rule, DOE adopts the amendments to energy conservation standard text at 10 CFR 430.32 as proposed in the June 2021 NOPR.

G. Test Procedures Costs and Impacts

In this final rule, DOE amends the existing test procedures for GSIL, IRLs, and GSFLs by: (1) updating references to industry test standards to reflect current industry practices; (2) modifying, adding, and removing definitions to better align with the scope and test methods; (3) referencing specific sections within industry test standards for further clarity; (4) providing a test method for measuring CRI for incandescent lamps to support DOE requirements; (5) providing a test method for measuring lifetime of IRLs to support the FTC's labeling requirements; (6) clarifying test frequency and inclusion of cathode power in measurements for GSFLs; (7) decreasing the sample size and specifying all metrics for all lamps be measured from the same sample of units. In addition, this final rule aligns terminology across appendix R, the relevant sections of 10 CFR part 429, 10 CFR 430.23(r), 10 CFR 430.32(n) and 10 CFR 430.32(x) and updates language for conciseness and clarity. DOE also updates certain represented value

calculations and rounding requirements. DOE has determined that the test procedure as amended by this final rule would impact testing costs as discussed in the following paragraphs.

DOE has determined that the updates to the GSFL, IRL, and GSIL test procedures will not increase test burden and would result in cost savings. The amendments adopted in this final rule primarily provide updates and clarifications for how to conduct the test procedures and do not add complexity to test conditions or setup. This final rule adds references to specific sections of industry test standards to provide precise direction when conducting the test procedures. Revisions to definitions and test conditions only clarify the test method. Further, the reorganization and alignment of terminology among relevant sections of the CFR improves readability and provides clarity throughout the sampling requirements, test procedure, and applicable energy conservation standards.

The adopted provision specifying the frequency for testing and whether cathode heat is included in measurements reflects the stated direction in industry test standards referenced by the current test procedures and also standard industry practice as verified by product submissions in DOE's Compliance Certification Database. Because DOE is specifying details that are already required or in use, DOE concludes that there are no costs incurred due to this final rule.

Measurement of the CRI of incandescent lamps and measuring lifetime of incandescent reflector lamps is already required by DOE, EISA 2007, or FTC. As such, manufacturers already conduct this test for covered products. The method of measuring CRI has not changed substantively in over 20 years (the referenced industry test standard was last updated in 1995) and therefore the method of measurement used by manufacturers is likely substantively similar to the method adopted by this final rule. Further, the data required for CRI can be gathered via an integrating sphere at the same time the sphere is used to measure lumen output. Thus, the data to determine CRI can be

gathered while measuring a quantity that is used in a metric already reported to DOE (*i.e.*, lamp efficacy).

Regarding lifetime, the FTC requires manufacturers to report life (in years) of IRLs on its Lighting Facts label. 16 CFR 305.23(b)(3)(ii) The lifetime test method used in support of the Lighting Facts label is likely substantively similar to the method adopted by DOE. The industry test method that describes measuring the lifetime of incandescent filament lamps is IES LM-49. Although IES LM-49 was updated in 2020, DOE concludes that changes in the updated version are only explicitly stating what is already practiced by test labs. Therefore, because industry is already conducting tests for the CRI of incandescent lamps and the lifetime of IRLs, and using methods that are substantively similar to the methods adopted in this final rule, DOE concludes that there are no costs incurred due to these proposed test methods. 86 FR 29888, 29908.

DOE is also allowing manufacturers to make voluntary representations of certain GSFLs. Manufacturers can voluntarily make representations at the high frequency settings specified in the 2016 versions of ANSI C78.81 and ANSI C78.901 in accordance with test procedures specified in appendix R and sampling requirements in 10 CFR 429.27. These values will not be used for compliance but rather would be in addition to values obtained for compliance and used by DOE for determining if and how standards for GSFLs should be amended in the future to accommodate testing at high frequency settings.

DOE adopts updates to represented value calculations and rounding requirements in this final rule. These do not pose added burden as determination of represented values and rounding are actions manufacturers are already required to do when they annually certify basic models to DOE.

In the June 2021 NPR, DOE determined the cost savings associated with the proposal to change the minimum sample size to 10 lamps instead of 21 lamps. Because

current certifications already must be based on a sample size of more than 10 units, products currently certified to DOE would not have to be retested as a result of this change. However, manufacturers would be able to use the new sampling requirements when new products are introduced and certified to DOE. Based on a review of submission dates for GSFL, IRL, and GSIL basic models in DOE's Compliance Certification Database, DOE determined the number of new model certifications during the period 2016-2018. An average of 196 GSFL, 30 IRL, and 84 GSIL new models were certified over these years. The cost to test efficacy, CCT, and CRI at a third-party laboratory is approximately \$90 per unit for a GSFL and approximately \$75 per unit for an IRL or GSIL. Based on feedback from laboratories, a reduction in sample size would not change costs for lifetime testing for GSILs. Thus, in the June 2021 NOPR, DOE estimated the annual industry-wide savings for GSFLs due to reduced sample size requirements to be \$193,710, for IRLs to be \$24,475 and for GSILs to be \$69,025. *Id.*

NEMA commented that cost savings opportunities are small, as GSFLs, IRLs, and GSILs are highly mature technologies with declining sales. As an alternative NEMA encouraged DOE to reduce test costs for other, newer technology options sooner than has been proposed for this sector. (NEMA, No. 12 at p. 6)

DOE notes that the scope of this rulemaking is to review and amend, as applicable, the test procedures for GSFLs, IRLs, and GSILs and the associated sampling and certification requirements. DOE has determined that for these covered products, the amendments to the sampling requirements adopted in this final rule will result in test cost savings as estimated in the June 2021 NOPR.

DOE did not receive any comments on the cost estimates presented in the June 2021 NOPR. In this final rule, DOE maintains the conclusion that the adopted updates do not result in added test burden and the change to sample size results in cost savings as previously discussed in the June 2021 NOPR and in this document. Further, the

amendments adopted in this final rule will not require changes to the designs of GSFLs, IRLs, or GSILs, and the adopted amendments will not impact the utility of such products or impact the availability of GSFL, IRL, or GSIL products. The adopted amendments will not impact the representations of GSFL, IRL, or GSIL energy efficiency. As such, the retesting of GSFLs, IRLs, or GSILs will not be required solely as a result of DOE's adoption of the proposed amendments to the test procedure.

H. Effective and Compliance Dates

The effective date for the adopted test procedure amendment will be 30 days after publication of this final rule in the *Federal Register*. EPCA prescribes that all representations of energy efficiency and energy use, including those made on marketing materials and product labels, must be made in accordance with an amended test procedure, beginning 180 days after publication of the final rule in the *Federal Register*. (42 U.S.C. 6293(c)(2)) EPCA provides an allowance for individual manufacturers to petition DOE for an extension of the 180-day period if the manufacturer may experience undue hardship in meeting the deadline. (42 U.S.C. 6293(c)(3)) To receive such an extension, petitions must be filed with DOE no later than 60 days before the end of the 180-day period and must detail how the manufacturer will experience undue hardship. (*Id.*)

IV. Procedural Issues and Regulatory Review

A. Review Under Executive Orders 12866 and 13563

Executive Order ("E.O.") 12866, "Regulatory Planning and Review," as supplemented and reaffirmed by E.O. 13563, "Improving Regulation and Regulatory Review," 76 FR 3821 (Jan. 21, 2011), requires agencies, to the extent permitted by law, to (1) propose or adopt a regulation only upon a reasoned determination that its benefits justify its costs (recognizing that some benefits and costs are difficult to quantify); (2) tailor regulations to impose the least burden on society, consistent with obtaining

regulatory objectives, taking into account, among other things, and to the extent practicable, the costs of cumulative regulations; (3) select, in choosing among alternative regulatory approaches, those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity); (4) to the extent feasible, specify performance objectives, rather than specifying the behavior or manner of compliance that regulated entities must adopt; and (5) identify and assess available alternatives to direct regulation, including providing economic incentives to encourage the desired behavior, such as user fees or marketable permits, or providing information upon which choices can be made by the public. DOE emphasizes as well that E.O. 13563 requires agencies to use the best available techniques to quantify anticipated present and future benefits and costs as accurately as possible. In its guidance, the Office of Information and Regulatory Affairs (“OIRA”) in the Office of Management and Budget (“OMB”) has emphasized that such techniques may include identifying changing future compliance costs that might result from technological innovation or anticipated behavioral changes. For the reasons stated in the preamble, this final regulatory action is consistent with these principles.

Section 6(a) of E.O. 12866 also requires agencies to submit “significant regulatory actions” to OIRA for review. OIRA has determined that this final regulatory action does not constitute a “significant regulatory action” under section 3(f) of E.O. 12866. Accordingly, this action was not submitted to OIRA for review under E.O. 12866.

B. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires preparation of a final regulatory flexibility analysis (“FRFA”) for any final rule where the agency was first required by law to publish a proposed rule for public comment, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a

substantial number of small entities. As required by Executive Order 13272, “Proper Consideration of Small Entities in Agency Rulemaking,” 67 FR 53461 (August 16, 2002), DOE published procedures and policies on February 19, 2003, to ensure that the potential impacts of its rules on small entities are properly considered during the DOE rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of the General Counsel’s website: www.energy.gov/gc/office-general-counsel.

DOE reviewed this rule to amend the test procedures for GSFLs, IRLs, and GSILs under the provisions of the Regulatory Flexibility Act and the procedures and policies published on February 19, 2003. DOE certifies that this final rule will not have a significant impact on a substantial number of small entities. The factual basis for this certification is set forth in the following paragraphs.

The Small Business Administration (“SBA”) considers a business entity to be a small business if, together with its affiliates, it employs less than a threshold number of workers specified in 13 CFR part 121. The size standards and codes are established by the 2017 North American Industry Classification System (“NAICS”).

GSFL, IRL, and GSIL manufacturers are classified under NAICS code 335110, “electric lamp bulb and part manufacturing.” The SBA sets a threshold of 1,250 employees or fewer for an entity to be considered as a small business for this NAICS code. DOE conducted a focused inquiry into small business manufacturers of the GSFLs, IRLs, and GSILs covered by this rulemaking. DOE used available public information to identify potential small manufacturers. DOE accessed the Compliance Certification Database³⁷ to identify basic models of GSFLs, IRLs, and GSILs. DOE then used other publicly available data sources, such as California Energy Commission’s Modernized

³⁷ U.S. Department of Energy Compliance Certification Database, available at: www.regulations.doe.gov/certification-data/products.html#q=Product_Group_s%3A*.

Appliance Efficiency Database System and company specific product literature, to create a list of companies that import or otherwise manufacture the GSFL, IRL, and GSIL models covered by this rulemaking. Using these sources, DOE identified a total of 20 distinct companies that import or manufacture GSFLs, IRLs, or GSILs in the United States.

DOE then reviewed these companies to determine whether the entities met the SBA's definition of a "small business" as it relates to NAICS code 335110 and screened out any companies that do not offer products covered by this rulemaking, do not meet the definition of a "small business," or are foreign owned and operated. DOE did not identify any small businesses that manufacture GSFLs, IRLs, or GSILs in the United States.

In response to the June 2021 NOPR, NEMA stated that it is not aware of any small businesses that manufacture GSFLs, IRLs, and GSILs in the United States.

(NEMA, No. 12 at p. 6)

Because DOE identified no small businesses that manufacture GSFLs, IRLs, or GSILs in the United States, DOE concludes and certifies that the cost effects accruing from the final rule would not have a "significant economic impact on a substantial number of small entities," and that the preparation of a FRFA is not warranted.

C. Review Under the Paperwork Reduction Act of 1995

Manufacturers of GSFLs, IRLs, and GSILs must certify to DOE that their products comply with any applicable energy conservation standards. To certify compliance, manufacturers must first obtain test data for their products according to the DOE test procedures, including any amendments adopted for those test procedures. DOE has established regulations for the certification and recordkeeping requirements for all covered consumer products and commercial equipment, including GSFLs, IRLs, and GSILs. (*See generally* 10 CFR part 429.) The collection-of-information requirement for

the certification and recordkeeping is subject to review and approval by OMB under the Paperwork Reduction Act (“PRA”). This requirement has been approved by OMB under OMB control number 1910-1400. Public reporting burden for the certification is estimated to average 35 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

DOE is not adding to the certification or reporting requirements for GSFLs, IRLs, or GSILs in this final rule.

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the PRA, unless that collection of information displays a currently valid OMB Control Number.

D. Review Under the National Environmental Policy Act of 1969

In this final rule, DOE establishes test procedure amendments that it expects will be used to develop and implement future energy conservation standards for GSFLs, IRLs, and GSILs. DOE has determined that this rule falls into a class of actions that are categorically excluded from review under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*) and DOE’s implementing regulations at 10 CFR part 1021. Specifically, DOE has determined that adopting test procedures for measuring energy efficiency of consumer products and industrial equipment is consistent with activities identified in 10 CFR part 1021, appendix A to subpart D, A5 and A6. Accordingly, neither an environmental assessment nor an environmental impact statement is required.

E. Review Under Executive Order 13132

Executive Order 13132, “Federalism,” 64 FR 43255 (August 4, 1999), imposes certain requirements on agencies formulating and implementing policies or regulations that preempt State law or that have federalism implications. The Executive order requires

agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and to carefully assess the necessity for such actions. The Executive order also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow in the development of such regulations. 65 FR 13735. DOE examined this final rule and determined that it will not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the products that are the subject of this final rule. States can petition DOE for exemption from such preemption to the extent, and based on criteria, set forth in EPCA. (42 U.S.C. 6297(d)) No further action is required by Executive Order 13132.

F. Review Under Executive Order 12988

Regarding the review of existing regulations and the promulgation of new regulations, section 3(a) of Executive Order 12988, "Civil Justice Reform," 61 FR 4729 (Feb. 7, 1996), imposes on Federal agencies the general duty to adhere to the following requirements: (1) eliminate drafting errors and ambiguity; (2) write regulations to minimize litigation; (3) provide a clear legal standard for affected conduct rather than a general standard; and (4) promote simplification and burden reduction. Section 3(b) of Executive Order 12988 specifically requires that executive agencies make every reasonable effort to ensure that the regulation (1) clearly specifies the preemptive effect, if any; (2) clearly specifies any effect on existing Federal law or regulation; (3) provides a clear legal standard for affected conduct while promoting simplification and burden reduction; (4) specifies the retroactive effect, if any; (5) adequately defines key terms;

and (6) addresses other important issues affecting clarity and general draftsmanship under any guidelines issued by the Attorney General. Section 3(c) of Executive Order 12988 requires Executive agencies to review regulations in light of applicable standards in sections 3(a) and 3(b) to determine whether they are met or it is unreasonable to meet one or more of them. DOE has completed the required review and determined that, to the extent permitted by law, this final rule meets the relevant standards of Executive Order 12988.

G. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (“UMRA”) requires each Federal agency to assess the effects of Federal regulatory actions on State, local, and Tribal governments and the private sector. Pub. L. 104-4, sec. 201 (codified at 2 U.S.C. 1531). For a regulatory action resulting in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector of \$100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (b)) The UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and Tribal governments on a proposed “significant intergovernmental mandate,” and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect small governments. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820; also available at www.energy.gov/gc/office-general-counsel. DOE examined this final rule according to UMRA and its statement of policy and determined that the rule contains neither an

intergovernmental mandate, nor a mandate that may result in the expenditure of \$100 million or more in any year, so these requirements do not apply.

H. Review Under the Treasury and General Government Appropriations Act, 1999

Section 654 of the Treasury and General Government Appropriations Act, 1999 (Pub. L. 105-277) requires Federal agencies to issue a Family Policymaking Assessment for any rule that may affect family well-being. This final rule will not have any impact on the autonomy or integrity of the family as an institution. Accordingly, DOE has concluded that it is not necessary to prepare a Family Policymaking Assessment.

I. Review Under Executive Order 12630

DOE has determined, under Executive Order 12630, “Governmental Actions and Interference with Constitutionally Protected Property Rights” 53 FR 8859 (March 18, 1988), that this regulation will not result in any takings that might require compensation under the Fifth Amendment to the U.S. Constitution.

J. Review Under Treasury and General Government Appropriations Act, 2001

Section 515 of the Treasury and General Government Appropriations Act, 2001 (44 U.S.C. 3516 note) provides for agencies to review most disseminations of information to the public under guidelines established by each agency pursuant to general guidelines issued by OMB. OMB’s guidelines were published at 67 FR 8452 (Feb. 22, 2002), and DOE’s guidelines were published at 67 FR 62446 (Oct. 7, 2002). Pursuant to OMB Memorandum M-19-15, Improving Implementation of the Information Quality Act (April 24, 2019), DOE published updated guidelines which are available at www.energy.gov/sites/prod/files/2019/12/f70/DOE%20Final%20Updated%20IQA%20Guidelines%20Dec%202019.pdf. DOE has reviewed this final rule under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

K. Review Under Executive Order 13211

Executive Order 13211, “Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use,” 66 FR 28355 (May 22, 2001), requires Federal agencies to prepare and submit to OMB, a Statement of Energy Effects for any significant energy action. A “significant energy action” is defined as any action by an agency that promulgated or is expected to lead to promulgation of a final rule, and that (1) is a significant regulatory action under Executive Order 12866, or any successor order; and (2) is likely to have a significant adverse effect on the supply, distribution, or use of energy; or (3) is designated by the Administrator of OIRA as a significant energy action. For any significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use if the regulation is implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use.

This regulatory action is not a significant regulatory action under Executive Order 12866. Moreover, it would not have a significant adverse effect on the supply, distribution, or use of energy, nor has it been designated as a significant energy action by the Administrator of OIRA. Therefore, it is not a significant energy action, and, accordingly, DOE has not prepared a Statement of Energy Effects.

L. Review Under Section 32 of the Federal Energy Administration Act of 1974

Under section 301 of the Department of Energy Organization Act (Pub. L. 95–91; 42 U.S.C. 7101), DOE must comply with section 32 of the Federal Energy Administration Act of 1974, as amended by the Federal Energy Administration Authorization Act of 1977. (15 U.S.C. 788; “FEAA”) Section 32 essentially provides in relevant part that, where a proposed rule authorizes or requires use of commercial standards, the notice of proposed rulemaking must inform the public of the use and background of such standards. In addition, section 32(c) requires DOE to consult with

the Attorney General and the Chairman of the FTC concerning the impact of the commercial or industry standards on competition.

The modifications to the test procedures for GSFLs, IRLs, and GSILs adopted in this final rule incorporate testing methods contained in certain sections of the following industry standards:

- (1) ANSI C78.21, “American National Standard for Electric Lamps - PAR and R Shapes,” 2011 (R2016);
- (2) ANSI C78.79, “American National Standard for Electric Lamps - Nomenclature for Envelope Shapes Intended for Use with Electric Lamps,” 2014 (R2020);
- (3) ANSI C78.81, “American National Standard for Electric Lamps – Double-Capped Fluorescent Lamps – Dimensional and Electrical Characteristics,” 2016;
- (4) ANSI C78.375A, “American National Standard for Electric Lamps - Fluorescent Lamps – Guide for Electrical Measures,” 2014 (R2020);
- (5) ANSI C78.901, “American National Standard for Electric Lamps – Single-Based Fluorescent Lamps – Dimensional and Electrical Characteristics,” 2016;
- (6) ANSI C82.3, “American National Standard for Electric Lamps – Reference Ballasts for Fluorescent Lamps,” 2016;
- (7) IES LM-9, “ANSI/IES LM-9-2020—Approved Method: Electrical and Photometric Measurements of Fluorescent Lamps,” 2020;
- (8) IES LM-20, “ANSI/IES LM-20-20 Approved Method: Photometry of Reflector Type Lamps,” 2020;
- (9) IES LM-45, “ANSI/IES LM-45-20 Approved Method: Electrical and Photometric Measurements of General Service Incandescent Filament Lamps,” 2020;
- (10) IES LM-49, “ANSI/IES LM-49-20 Approved Method: Life Testing of Incandescent Filament Lamps,” 2020;

- (11) IES LM-54, “ANSI/IES LM-54-20 Approved Method: IES Guide to Lamp Seasoning,” 2020;
- (12) IES LM-58, “ANSI/IES LM-58-20 Approved Method: Spectroradiometric Measurement Methods for Light Sources,” 2020;
- (13) IES LM-78, “ANSI/IES LM-78-20 Approved Method: Total Luminous Flux Measurement of Lamps Using an Integrating Sphere Photometer,” 2020; and
- 14) CIE 15:2018, “Colorimetry, 4th Edition,” 2018.

DOE has evaluated these standards and is unable to conclude whether they fully comply with the requirements of section 32(b) of the FEAA (*i.e.*, whether it was developed in a manner that fully provides for public participation, comment, and review.) DOE has consulted with both the Attorney General and the Chairman of the FTC about the impact on competition of using the methods contained in these standards and has received no comments objecting to their use.

M. Congressional Notification

As required by 5 U.S.C. 801, DOE will report to Congress on the promulgation of this rule before its effective date. The report will state that it has been determined that the rule is not a "major rule" as defined by 5 U.S.C. 804(2).

N. Description of Materials Incorporated by Reference

ANSI C78.21-2011 (R2016) is an industry accepted test standard that provides physical and electrical characteristics of the group of incandescent lamps that have PAR and R bulb shapes. Specifically, the test procedure codified by this final rule references sections of ANSI C78.21-2011 (R2016) for definitions of incandescent reflector lamps. .

ANSI C78.79-2014 (R2020) is an industry accepted test standard that describes a system of nomenclature that provides designations for envelope shapes used for all electric lamps. Specifically, the test procedure codified by this final rule references sections of ANSI C78.79-2014 (R2020) for definitions of IRLs.

ANSI C78.375A-2014 (R2020) is an industry accepted test standard that describes procedures for measuring the electrical characteristics of fluorescent lamps. Specifically, the test procedure codified by this final rule references sections of ANSI C78.375A-2014 (R2020) for voltage and current conditions when testing performance of fluorescent lamps.

ANSI C82.3-2016 is an industry accepted standard that describes characteristics and requirements of fluorescent lamp reference ballasts. Specifically, the test procedure codified by this final rule references ANSI C82.3-2016 for setting up the reference circuit when testing the performance of fluorescent lamps.

ANSI C78.81-2016 is an industry accepted standard that provides electrical characteristics for double base fluorescent lamps and reference ballasts. Specifically, the test procedure codified by this final rule references ANSI C78.81-2016 for reference ballast settings to test the performance of fluorescent lamps using high frequency reference ballast settings for making voluntary representations to DOE.

ANSI C78.901-2016 is an industry accepted standard that provides electrical characteristics for single base fluorescent lamps and reference ballasts. Specifically, the test procedure codified by this final rule references ANSI C78.901-2016 for reference ballast settings to test the performance of fluorescent lamps using high frequency reference ballast settings for making voluntary representations to DOE.

These test standards are all reasonably available from ANSI (<https://webstore.ansi.org>) or NEMA (www.nema.org).

IES LM-9-20 is an industry accepted standard that describes the method for taking electrical and photometric measurements of fluorescent lamps. Specifically, the test procedure codified by this final rule references IES LM-9-20 for testing GSFLs.

IES LM-20-20 is an industry accepted standard that describes the method for taking photometric measurements of reflector lamps. Specifically, the test procedure

codified by this final rule references IES LM-20-20 for IES LM-45-20 is an industry accepted standard that describes the method for taking electrical and photometric measurements of incandescent lamps. Specifically, the test procedure codified by this final rule references IES LM-45-20 for testing GSILs.

IES LM-49-20 is an industry accepted standard that describes the method for determining the lifetime of an incandescent filament lamp. Specifically, the test procedure codified by this final rule references IES LM-49-20 for testing the lifetime of incandescent lamps.

IES LM-54-20 is an industry accepted test standard that specifies a method for seasoning lamps. Specifically, the test procedure codified by this final rule references IES LM-9-20, IES LM-20-20, and IES LM-45-20 for testing the performance of GSFLs, IRLs, and GSILs, respectively, which in turn references IES LM-54-20 for seasoning lamps.

IES LM-58-20 is an industry accepted standard that describes methods for taking spectroradiometric measurements for light sources. Specifically, the test procedure codified by this final rule references IES LM-58-20 for determining the CRI and CCT of fluorescent lamps and incandescent lamps and CRI of incandescent reflector lamps.

IES LM-78-20 is an industry accepted standard that specifies a method for measuring lumen output in an integrating sphere. Specifically, the test procedure codified by this final rule references IES LM-9-20, IES LM-20-20, and IES LM-45-20 for testing the performance of GSFLs, IRLs, and GSILs, which in turn references IES LM-78-20 for integrating sphere photometer calibration and measurements. IES LM-78 is readily available on IES's website at www.ies.org/store.

These test standards are all reasonably available from ANSI (<https://webstore.ansi.org>) or IES (www.ies.org/store).

CIE 15:2018 is an industry accepted test standard that specifies methods for taking color measurements. Specifically, the test procedure codified by this final rule references CIE 15:2018 for testing CCT. CIE 15:2018 is reasonably available from CIE (<https://cie.co.at/publications>).

In this final rule, DOE included revisions to regulatory text that contained references to ANSI C78.3, ANSI C78.21-1989, and CIE 13.3. These standards were previously approved for incorporation by reference (IBR); no changes are being made. In addition, DOE is renaming the abbreviated term “ANSI C78.901” to “ANSI C78.901-2005” and the abbreviated term “ANSI C78.81” to “ANSI C78.81-2010” in the regulatory text of §430.3. These standards were also previously approved for IBR in the regulatory text where they are referenced; no changes are being made.

V. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this final rule.

List of Subjects

10 CFR Part 429

Administrative practice and procedure, Confidential business information, Energy conservation, Household appliances, Reporting and recordkeeping requirements.

10 CFR Part 430

Administrative practice and procedure, Confidential business information, Energy conservation, Household appliances, Imports, Incorporation by reference, Intergovernmental relations, Small businesses.

Signing Authority

This document of the Department of Energy was signed on August 14, 2022, by Kelly J. Speakes-Backman, Principal Deputy Assistant Secretary for Energy Efficiency and Renewable Energy, pursuant to delegated authority from the Secretary of Energy. That

document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, DC, on August 15, 2022.

Treena V. Garrett
Federal Register Liaison Officer,
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For the reasons stated in the preamble, DOE amends parts 429 and 430 of Chapter II of Title 10, Code of Federal Regulations as set forth below:

**PART 429--CERTIFICATION, COMPLIANCE, AND ENFORCEMENT FOR
CONSUMER PRODUCTS AND COMMERCIAL AND INDUSTRIAL
EQUIPMENT**

1. The authority citation for part 429 continues to read as follows:

Authority: 42 U.S.C. 6291-6317; 28 U.S.C. 2461 note.

§429.11 [Amended]

2. Amend §429.11 by:

- a. In paragraph (a) removing “429.62” and adding in its place “429.66”; and
- b. In paragraph (b)(1) removing, “429.65” and adding in its place “429.66”.

§429.12 [Amended]

3. Amend §429.12 by removing paragraph (e)(2) and redesignating paragraph (e)(3) as paragraph (e)(2).

4. Revise §429.27 to read as follows:

§429.27 General service fluorescent lamps.

Note 1 to §429.27: Prior to February 17, 2023, certification reports must be submitted as required either in this section or 10 CFR 429.27 as it appears in the 10 CFR parts 200 through 499 edition revised as of January 1, 2022. On or after February 17, 2023, certification reports must be submitted as required in this section.

(a) *Determination of Represented Value.* Each manufacturer must determine represented values, which include certified ratings, for each basic model by testing, in accordance with the following sampling provisions.

- (1) Units to be tested.

(i) When testing, use a sample comprised of production units. The same sample of units must be tested and used as the basis for representations for rated wattage, average lamp efficacy, color rendering index (CRI), and correlated color temperature (CCT).

(ii) For each basic model, randomly select and test a sample of sufficient size, but not less than 10 units, to ensure that represented values of average lamp efficacy are less than or equal to the lower of:

(A) The arithmetic mean of the sample: or,

(B) The lower 95 percent confidence limit (LCL) of the true mean divided by .97,

where:

$$LCL = \bar{x} - t_{.95} \left(\frac{s}{\sqrt{n}} \right)$$

And \bar{x} is the sample mean; s is the sample standard deviation; n is the number of samples; and $t_{.95}$ is the t statistic for a 95% one-tailed confidence interval with $n-1$ degrees of freedom (from Appendix A).

(2) Any represented values of measures of energy efficiency or energy consumption for all individual models represented by a given basic model must be the same.

(3) Represented values of CCT, CRI and rated wattage must be equal to the arithmetic mean of the sample.

(b) *Certification reports.* (1) The requirements of §429.12 apply to general service fluorescent lamps; and

(2) Pursuant to §429.12(b)(13), a certification report shall include the following public product-specific information: The testing laboratory's ILAC accreditation body's identification number or other approved identification assigned by the ILAC accreditation body, average lamp efficacy in lumens per watt (lm/W), rated wattage in watts (W), CCT in Kelvin (K), and CRI.

(c) *Rounding Requirements.* (1) Round rated wattage to the nearest tenth of a watt.

(2) Round average lamp efficacy to the nearest tenth of a lumen per watt.

(3) Round CCT to the nearest 100 kelvin (K).

(4) Round CRI to the nearest whole number.

§429.33 [Amended]

5. Amend §429.33 by:

a. In paragraph (a)(2)(iv) removing “§429.27” and adding “§429.40, §429.55 or §429.66, as applicable” in its place; and

b. In paragraph (a)(3)(i)(C) removing “§429.27” and adding “§429.40, §429.55 or §429.66, as applicable,” in its place.

6. Add §429.55 to read as follows:

§429.55 Incandescent reflector lamps.

Note 1 to §429.55: Prior to February 17, 2023, certification reports must be submitted as required either in this section or 10 CFR 429.27 as it appears in the 10 CFR parts 200 through 499 edition revised as of January 1, 2022. On or after February 17, 2023, certification reports must be submitted as required in this section.

(a) *Determination of Represented Value.* Each manufacturer must determine represented values, which include the certified ratings, for each basic model, in accordance with the following sampling provisions.

(1) Units to be tested.

(i) When testing, use a sample comprised of production units. The same sample of units must be tested and used as the basis for representations for initial lumen output, rated wattage, lamp efficacy, color rendering index (CRI), correlated color temperature (CCT), and lifetime.

(ii) For each basic model, randomly select and test a sample of sufficient size, but not less than 10 units, to ensure that represented values of average lamp efficacy, CRI and initial lumen output are less than or equal to the lower of:

(A) The arithmetic mean of the sample; or,

(B) The lower 95 percent confidence limit (LCL) of the true mean divided by .97,

where:

$$LCL = \bar{x} - t_{.95} \left(\frac{s}{\sqrt{n}} \right)$$

And \bar{x} is the sample mean; s is the sample standard deviation; n is the number of samples; and $t_{.95}$ is the t statistic for a 95% one-tailed confidence interval with n-1 degrees of freedom (from Appendix A).

(2) Any represented values of measures of energy efficiency or energy consumption for all individual models represented by a given basic model must be the same.

(3) Represented values of CCT and rated wattage must be equal to the arithmetic mean of the sample.

(4) Represented values of lifetime must be equal to or less than the median time to failure of the sample (calculated as the arithmetic mean of the time to failure of the two middle sample units (or the value of the middle sample unit if there are an odd number of units) when the measured values are sorted in value order).

(5) Calculate represented values of life (in years) by dividing the represented lifetime of these lamps as determined in paragraph (a)(4) of this section by the estimated daily operating hours as specified in 16 CFR 305.23(b)(3)(iii) multiplied by 365.

(6) Represented values of the estimated annual energy cost, expressed in dollars per year, must be the product of the rated wattage in kilowatts, an electricity cost rate as specified in 16 CFR 305.23(b)(1)(ii), and an estimated average daily use as specified in 16 CFR 305.23(b)(1)(ii) multiplied by 365.

(b) *Certification reports.* (1) The requirements of §429.12 apply to incandescent reflector lamps; and

(2) Pursuant to §429.12(b)(13), a certification report shall include the following public product-specific information: The testing laboratory's ILAC accreditation body's

identification number or other approved identification assigned by the ILAC accreditation body, average lamp efficacy in lumens per watt (lm/W), rated wattage in watts (W), rated voltage (V), diameter in inches, and CRI.

- (c) *Rounding Requirements.* (1) Round rated wattage to the nearest tenth of a watt.
- (2) Round initial lumen output to three significant digits.
- (3) Round average lamp efficacy to the nearest tenth of a lumen per watt.
- (4) Round CCT to the nearest 100 kelvin (K).
- (5) Round CRI to the nearest whole number.
- (6) Round lifetime to the nearest whole hour.
- (7) Round life (in years) to the nearest tenth.
- (8) Round annual energy cost to the nearest cent.

7. Add §429.66 to read as follows:

§429.66 General service incandescent lamps.

Note 1 to §429.66: Prior to February 17, 2023, certification reports must be submitted as required either in this section or 10 CFR 429.27 as it appears in the 10 CFR parts 200 through 499 edition revised as of January 1, 2022. On or after February 17, 2023, certification reports must be submitted as required in this section.

(a) *Determination of Represented Value.* Each manufacturer must determine represented values, which include certified ratings, for each basic model by testing in accordance with the following sampling provisions.

- (1) Units to be tested.

(i) When testing, use a sample comprised of production units. The same sample of units must be tested and used as the basis for representations for initial lumen output, rated wattage, color rendering index (CRI), correlated color temperature (CCT), and lifetime.

(ii) For each basic model, randomly select and test a sample of sufficient size, but not less than 10 units, to ensure that—

(A) Represented values of initial lumen output and CRI are less than or equal to the lower of:

(1) The arithmetic mean of the sample: or,

(2) The lower 95 percent confidence limit (LCL) of the true mean divided by .97,

where:

$$LCL = \bar{x} - t_{.95} \left(\frac{s}{\sqrt{n}} \right)$$

And \bar{x} is the sample mean; s is the sample standard deviation; n is the number of samples; and $t_{0.95}$ is the t statistic for a 95% one-tailed confidence interval with n-1 degrees of freedom (from Appendix A).

(B) Represented values of rated wattage are greater than or equal to the higher of:

(1) The arithmetic mean of the sample: or,

(2) The upper 95 percent confidence limit (UCL) of the true mean divided by 1.03,

where:

$$UCL = \bar{x} + t_{.95} \left(\frac{s}{\sqrt{n}} \right)$$

and \bar{x} is the sample mean; s is the sample standard deviation; n is the number of samples; and $t_{0.95}$ is the t statistic for a 95% one-tailed confidence interval with n-1 degrees of freedom (from appendix A to this subpart).

(2) Any represented values of measures of energy efficiency or energy consumption for all individual models represented by a given basic model must be the same.

(3) Represented values of CCT must be equal to the arithmetic mean of the sample.

(4) Represented values of lifetime must be equal to or less than the median time to failure of the sample (calculated as the arithmetic mean of the time to failure of the two

middle sample units (or the value of the middle sample unit if there are an odd number of units) when the measured values are sorted in value order).

(5) Calculate represented values of life (in years) by dividing the represented lifetime of these lamps as determined in paragraph (a)(4) of this section by the estimated daily operating hours as specified in 16 CFR 305.23(b)(3)(iii) multiplied by 365.

(6) Represented values of the estimated annual energy cost, expressed in dollars per year, must be the product of the rated wattage in kilowatts, an electricity cost rate as specified in 16 CFR 305.23(b)(1)(ii), and an estimated average daily use as specified in 16 CFR 305.23(b)(1)(ii) multiplied by 365.

(b) *Certification reports.* (1) The requirements of §429.12 apply to general service incandescent lamps; and

(2) Pursuant to §429.12(b)(13), a certification report shall include the following public product-specific information: The testing laboratory's ILAC accreditation body's identification number or other approved identification assigned by the ILAC accreditation body, rated wattage in watts (W), the lifetime in hours, CRI, and initial lumen output in lumens (lm).

(c) *Rounding Requirements.* (1) Round rated wattage to the nearest tenth of a watt.

(2) Round initial lumen output to three significant digits.

(3) Round CCT to the nearest 100 kelvin (K).

(4) Round CRI to the nearest whole number.

(5) Round lifetime to the nearest whole hour.

(6) Round life (in years) to the nearest tenth.

(7) Round annual energy cost to the nearest cent.

§429.102 [Amended]

8. In §429.102 amend paragraph (a)(1) by removing “429.62” and adding in its place “429.66”.

PART 430 -- ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

9. The authority citation for part 430 continues to read as follows:

Authority: 42 U.S.C. 6291-6309; 28 U.S.C. 2461 note.

10. Amend §430.2 by:

- a. In the definition for “Basic model” revising paragraph (1);
- b. Revising definitions for “BPAR incandescent reflector lamp”, “BR incandescent reflector lamp”, and “ER incandescent reflector lamp”;
- c. Adding, in alphabetical order, definitions for “Lifetime”, “PAR incandescent reflector lamp”, and “R incandescent reflector lamp”;
- d. Revising the definition for “R20 incandescent reflector lamp”;
- e. Removing the definition for “Rated lifetime for general service incandescent lamps” and the second definition of “BR incandescent reflector lamp”; and
- f. In the definition for “Rated wattage” revising paragraphs (1)(iii) and (2) and adding paragraph (3).

The revisions and addition read as follows:

§430.2 Definitions.

* * * * *

Basic model * * *

(1) With respect to general service fluorescent lamps, general service incandescent lamps, and incandescent reflector lamps: Lamps that have essentially identical light output and electrical characteristics—including lamp efficacy and color rendering index (CRI).

* * * * *

BPAR incandescent reflector lamp means a reflector lamp as shown in figure C78.21-278 of ANSI C78.21-2016 (incorporated by reference; see §430.3).

* * * * *

BR incandescent reflector lamp means a reflector lamp that has a bulged section below the bulb's major diameter and above its approximate base line as shown in Figure 1 (RB) of ANSI C78.79-2020. A BR30 lamp has a lamp wattage of 85 or less than 66 and a BR40 lamp has a lamp wattage of 120 or less.

* * * * *

ER incandescent reflector lamp means a reflector lamp that has an elliptical section below the major diameter of the bulb and above the approximate base line of the bulb, as shown in Figure 1 (RE) of ANSI C78.79-2020 (incorporated by reference; see §430.3) and product space drawings shown in ANSI C78.21-2016 (incorporated by reference; see §430.3).

* * * * *

Lifetime with respect to an incandescent reflector lamp or general service incandescent lamp means the length of operating time between first use and failure of 50 percent of the sample units (as specified in 10 CFR 429.55 and 429.66), determined in accordance with the test procedures described in appendix R to subpart B of this part.

* * * * *

PAR incandescent reflector lamp means a reflector lamp formed by the sealing together during the lamp-making process of a pressed glass parabolic section and a pressed lens section as shown in Figure 1 (PAR) of ANSI C78.79-2020, (incorporated by reference; see §430.3). The pressed lens section may be either plain or configured.

* * * * *

R incandescent reflector lamp means a reflector lamp that includes a parabolic or elliptical section below the major diameter as shown in Figure 1 (R) of ANSI C78.79-2020 (incorporated by reference; see §430.3).

R20 incandescent reflector lamp means an R incandescent reflector lamp that has a face diameter of approximately 2.5 inches, as shown in Figure C78.21-254 of ANSI C78.21-2016 (incorporated by reference; see §430.3).

* * * * *

Rated wattage means:

(1) * * *

(iii) If the lamp is neither listed in one of the ANSI standards referenced in paragraph (1)(i) of this definition, nor a residential straight-shaped lamp, a represented value of electrical power for a basic model, determined according to 10 CFR 429.27, and derived from the measured initial input power of a lamp tested according to appendix R to subpart B of this part.

(2) With respect to general service incandescent lamps, a represented value of electrical power for a basic model, determined according to 10 CFR 429.27, and derived from the measured initial input power of a lamp tested according to appendix R to subpart B of this part.

(3) With respect to incandescent reflector lamps, a represented value of electrical power for a basic model, determined according to 10 CFR 429.55, and derived from the measured initial input power of a lamp tested according to appendix R to subpart B of this part.

* * * * *

11. Amend §430.3 by:

- a. Revising paragraph (e)(4);
- b. Removing paragraph (e)(17);

- c. Redesignating paragraphs (e)(5) through (16) as paragraphs (e)(6) through (17);
- d. Adding new paragraph (e)(5);
- e. In newly redesignated paragraph (e)(6), removing the text “(“ANSI C78.81”)” and adding, in its place, the text “(“ANSI C78.81-2010”)”;
- f. In newly redesignated paragraph (e)(7),
- i. Removing the text “(“ANSI C78.81-2016”),”; and
- ii. Removing the text “appendix Q”, and adding, in its place, the text “appendices Q and R”;
- g. Revising newly redesignated paragraph (e)(9);
- h. In newly redesignated paragraph (e)(10), removing the text “Revision of ANSI C78.901-2001 (“ANSI C78.901”)”, and adding, in its place, the text “ (“ANSI C78.901-2005”)”;
- i. In newly redesignated paragraph (e)(12), removing the text “appendix Q”, and adding, in its place, the text “appendices Q and R”;
- j. In newly redesigned paragraph (e)(15), remove the text “§ 430.2” and add, in its place, the text “§§ 430.2; 430.32”;
- k. In paragraph (e)(18), removing the text “appendix Q”, and adding, in its place, the text “appendices Q and R”
- l. Revising note 1 to paragraph (e);
- m. In paragraph (m)(2), removing the text “appendices R and W”, and adding, in its place, the text “appendix W”;
- n. Adding new paragraph (m)(3);
- o. Revising the introductory text to paragraph (q);
- p. In paragraph (q)(2), removing the text “appendices R, V, and V1” and adding, in its place, the text “appendices V and V1”;
- q. Redesignating paragraphs (q)(4) through (20) as follows:

Old paragraph	New paragraph
(q)(4)	(q)(5)
(q)(5)	(q)(7)
(q)(7)	(q)(9)
(q)(9) and (10)	(q)(10) and (11)
(q)(11) through (15)	(q)(13) through (17)
(q)(16) through (20)	(q)(19) through (23)

- r. Adding new paragraph (q)(4);
- s. Revising newly redesignated paragraphs (q)(7), (9) and, (10);
- t. Adding new paragraph (q)(12);
- u. Revising newly redesignated paragraph (q)(13); and
- v. Adding new paragraph (q)(18).

The revisions and additions read as follows:

§430.3 Materials incorporated by reference.

* * * * *

(e) * * *

(4) ANSI C78.21-2011 (R2016) (“ANSI C78.21-2016”), *American National Standard for Electric Lamps - PAR and R Shapes*, ANSI-approved August 23, 2016; IBR approved for §430.2.

(5) ANSI C78.79-2014 (R2020) (“ANSI C78.79-2020”), *American National Standard for Electric Lamps - Nomenclature for Envelope Shapes Intended for Use with Electric Lamps*, ANSI-approved January 17, 2020; IBR approved for §430.2.

* * * * *

(9) ANSI C78.375A-2014 (R2020) (“ANSI C78.375A-2020”) *American National Standard for Electric Lamps - Fluorescent Lamps - Guide for Electrical Measures*, ANSI-approved January 17, 2020; IBR approved for appendix R to subpart B.

* * * * *

NOTE 1 TO PARAGRAPH (e): The standards referenced in paragraphs (e)(4), (5), (7), (9), (12), (16), (17), (18), (19), and (21) of this section were all published by National Electrical Manufacturers Association (NEMA) and are also available from National Electrical Manufacturers Association, 1300 North 17th Street, Suite 900, Rosslyn, Virginia 22209, <https://www.nema.org/Standards/Pages/default.aspx>.

* * * * *

(m) * * *

(3) CIE 015:2018 (“CIE 15:2018”), *Colorimetry*, 4th edition, copyright 2018; IBR approved for the appendix R to subpart B.

* * * * *

(q) *IES*. Illuminating Engineering Society (formerly Illuminating Engineering Society of North America - IESNA), 120 Wall Street, Floor 17, New York, NY 10005-4001, 212-248-5000, or go to www.ies.org.

* * * * *

(4) ANSI/IES LM-9-20 (“IES LM-9-20”), *Approved Method: Electrical and Photometric Measurements of Fluorescent Lamps*, ANSI-approved February 7, 2020; IBR approved for appendix R to subpart B.

* * * * *

(7) ANSI/IES LM-20-20 (“IES LM-20-20”), *Approved Method: Photometry of Reflector Type Lamps*, ANSI-approved February 7, 2020; IBR approved for appendix R to subpart B.

* * * * *

(9) IES LM-45-20 (“IES LM-45-20”), *Approved Method: Electrical and Photometric Measurement of General Service Incandescent Filament Lamps*, ANSI-approved February 7, 2020; IBR approved for appendix R to subpart B.

(10) ANSI/IES LM-49-20 (“IES LM-49-20”), *Approved Method: Life Testing of Incandescent Filament Lamps*, ANSI-approved February 7, 2020; IBR approved for appendix R to subpart B.

* * * *

(12) ANSI/IES LM-54-20 (“IES LM-54-20”), *Approved Method: IES Guide to Lamp Seasoning*, ANSI-approved February 7, 2020; IBR approved for appendix R to subpart B.

(13) ANSI/IES LM-58-20 (“IES LM-58-20”), *Approved Method: Spectroradiometric Measurement Methods for Light Sources*; ANSI-approved February 7, 2020; IBR approved for appendix R to subpart B.

* * * *

(18) ANSI/IES LM-78-20 (“IES LM-78-20”) *Approved Method: Total Luminous Flux Measurement of Lamps Using an Integrating Sphere Photometer*, ANSI-approved February 7, 2020; IBR approved for appendix R to subpart B.

* * * *

12. Revise §430.23(r) to read as follows:

§430.23 Test procedures for the measurement of energy and water consumption.

* * * *

(r) *General service fluorescent lamps, general service incandescent lamps, and incandescent reflector lamps.* Measure initial lumen output, initial input power, initial lamp efficacy, color rendering index (CRI), correlated color temperature (CCT), and time to failure of GSFLs, IRLs, and GSILs, as applicable, in accordance with appendix R to this subpart.

* * * *

13. Revise appendix R to subpart B of part 430 to read as follows:

Appendix R to Subpart B of Part 430—Uniform Test Method for Measuring Electrical and Photometric Characteristics of General Service Fluorescent Lamps, Incandescent Reflector Lamps, and General Service Incandescent Lamps

Note: After [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*] and prior to [INSERT DATE 180 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*] any representations with respect to energy use or efficiency of general service fluorescent lamps, incandescent reflector lamps, and general service incandescent lamps must be in accordance with the results of testing pursuant to this appendix or the test procedures as they appeared in appendix R to subpart B of part 430 revised as of January 1, 2021. On or after [INSERT DATE 180 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*], any representations, including certifications of compliance for lamps subject to any energy conservation standard, made with respect to the energy use or efficiency of general service fluorescent lamps, incandescent reflector lamps, and general service incandescent lamps must be made in accordance with the results of testing pursuant to this appendix.

0. Incorporation by Reference

DOE incorporated by reference in §430.3, the entire standard for: IES LM-9-20, IES LM-20-20, IES LM-45-20, IES LM-49-20, IES LM-54-20, IES LM-58-20, IES LM-78-20, ANSI C78.375A-2020, ANSI C78.81-2010, ANSI C78.901-2005, ANSI C78.81-2016, ANSI C78.901-2016, ANSI C82.3, CIE 15:2018, and CIE 13.3; however, only enumerated provisions of IES LM-9-20, IES LM-20-20, IES LM-45-20, IES LM-49-20, IES LM-58-20, and CIE 13.3, are applicable to this appendix, as follows:

0.1 IES LM-9-20

(a) Section 3.0 “Nomenclature and Definitions” as referenced in section 2.1 of this appendix.

(b) Section 6.2.2 “Pre-burning” and Section 6.2.4 “Lamp Circuit Switching” as referenced in section 3.2 of this appendix.

(c) Section 4.0 “Ambient and Physical Conditions”, Section 5.0 “Electrical Conditions”, Section 6.1 “Lamp Orientation”, Section 6.5 “Electrical Settings”, and Section 6.6 “Electrical Instrumentation” as referenced in section 4.1.1.1 of this appendix.

(d) Section 6.1 “Lamp Orientation”, Section 6.2 “Lamp Stabilization”, Section 6.3 “Use of the "Peak Lumen" Method”, and Section 6.4 “Unusual Conditions” as referenced in section 4.2.1.1 of this appendix.

(e) Section 7.0 “Photometric Test Procedures” as referenced in section 4.2.1.3 of this appendix.

(f) Section 7.6 “Color Measurements” as referenced in sections 4.2.1.5 and 4.2.1.6 of this appendix.

0.2 IES LM-20-20

(a) Section 3.0 “Definitions” as referenced in section 2.1 of this appendix.

(b) Section 4.0 “Ambient and Physical Conditions” and Section 5.0 “Electrical and Photometric Test Conditions” as referenced in section 4.1.3 of this appendix.

(c) Section 6.0 “Lamp Test Procedures” as referenced in sections 4.2.3.1 and 6.2.1 of this appendix.

(d) Section 7.0 “Photometric Characterization by Measurement of Intensity Distribution”, Section 8.0 “Total Flux Measurement by Integrating Sphere Method”, and Section 8.2 “Exclusion of Undirected Light by Using a Luminaire Inside an Integrating Sphere” as referenced in section 4.2.3.3 of this appendix.

0.3 IES LM-45-20

(a) Section 3.0 “Nomenclature and Definitions” as referenced in section 2.1 of this appendix.

(b) Section 4.0 “Ambient and Physical Conditions”, Section 5.0 “Electrical Conditions”, section 6.1 “Lamp Position”, Section 6.3 “Electrical Settings”, and Section 6.4 “Electrical Instrumentation” as referenced in section 4.1.2 of this appendix.

(c) Section 6.2 “Lamp Stabilization” as referenced in sections 4.2.2.1 and 6.2.1 of this appendix.

(d) Section 7.0 “Photometric Test Procedures” as referenced in section 4.2.2.3 of this appendix.

(e) Section 7.4 “Color Measurements” as referenced in sections 4.2.2.5 and 4.2.2.6 of this appendix.

0.4 IES LM-49-20

(a) Section 4.0 “Ambient and Physical Conditions” and Section 5.0 “Electrical Conditions” as referenced in section 6.1 of this appendix.

(b) Section 6.4 “Operating Cycle” as referenced in sections 6.2.2 and 6.3 of this appendix.

0.5 IES LM-58-20

(a) Section 3.0 “Definitions and Nomenclature” as referenced in section 2.1 of this appendix.

(b) [Reserved]

0.6 CIE 13.3

(a) Appendix 1 “Terminology” as referenced in section 2.1 of this appendix.

(b) [Reserved]

1. Scope: This appendix specifies the test methods required for determining the electrical and photometric performance characteristics of general service fluorescent lamps (GSFLs), incandescent reflector lamps (IRLs), and general service incandescent lamps (GSILs).

2. Definitions

2.1 To the extent that definitions in the referenced IES and CIE standards do not conflict with the DOE definitions, the definitions specified in Section 3.0 of IES LM-9-

20 , Section 3.0 of IES LM-20-20 , Section 3.0 of IES LM-45-20 , Section 3.0 of IES LM-58-20 , and Appendix 1 of CIE 13.3 apply in this appendix.

2.2 *Initial input power* means the input power to the lamp, measured at the end of the lamp seasoning and stabilization.

2.3 *Initial lamp efficacy* means the lamp efficacy (as defined in §430.2), measured at the end of the lamp seasoning and stabilization.

2.4 *Initial lumen output* means the lumen output of the lamp, measured at the end of the lamp seasoning and stabilization.

2.5 *Time to failure* means the time elapsed between first use and the point at which the lamp ceases to produce measurable lumen output.

3. *General Instructions*

3.1 When there is a conflict, the language of the test procedure in this appendix takes precedence over any materials incorporated by reference.

3.2 Maintain lamp operating orientation throughout seasoning and testing, except that for T5 miniature bipin standard and high output GSFLs, follow Section 6.2.2 of IES LM-9-20. For all GSFLs, maintain lamp orientation when transferring lamps from a warm-up position to the photometric equipment per Section 6.2.4 of IES LM-9-20. Maintain lamp orientation at all other times, if practical.

3.3 If a lamp breaks, becomes defective, fails to stabilize, exhibits abnormal behavior (such as swirling), or stops producing light prior to the end of the seasoning period, replace the lamp with a new unit. However, if a lamp exhibits one of the conditions listed in the previous sentence only after the seasoning period ends, include the lamp's measurements in the sample.

3.4 Operate GSILs and IRLs at the rated voltage for incandescent lamps as defined in 10 CFR 430.2.

4. Test Method for Determining Initial Input Power, Initial Lumen Output, Initial Lamp Efficacy, CRI, and CCT

4.1 Test Conditions and Setup

4.1.1 General Service Fluorescent Lamps

4.1.1.1 Establish ambient, physical, and electrical conditions in accordance with Sections (and corresponding subsections) 4.0, 5.0, 6.1, 6.5, and 6.6 of IES LM-9-20.

4.1.1.2 Operate each lamp at the appropriate voltage and current conditions as described in ANSI C78.375A-2020 and in either ANSI C78.81-2010 or ANSI C78.901-2005. Operate each lamp using the appropriate reference ballast at input voltage specified by the reference circuit as described in ANSI C82.3. If, for a lamp, both low-frequency and high-frequency reference ballast settings are included in ANSI C78.81-2010 or ANSI C78.901-2005, operate the lamp using the low-frequency reference ballast. When testing with low-frequency reference ballast settings, include cathode power only if the circuit application of the lamp is specified as rapid start in ANSI C78.81-2010 or ANSI C78.901-2005. When testing with high-frequency reference ballast settings, do not include cathode power in the measurement.

For any lamp not listed in ANSI C78.81-2010 or ANSI C78.901-2005, operate the lamp using the following reference ballast settings:

4.1.1.2.1 For 4-Foot medium bi-pin lamps, use the following reference ballast settings:

(a) T10 or T12 lamps: 236 volts, 0.43 amps, and 439 ohms, at low frequency (60 Hz) and with cathode power. Approximate cathode wattage (with 3.6 V on each cathode): 2.0 W. Cathode characteristics for low resistance (at 3.6V): 9.6 ohms (objective), 7.0 ohms (minimum). Cathode heat for rapid start: 3.6 V (nominal); 2.5 V min, 4.0 V max (limits during operation); 9.6 ohms +/- 0.1 ohm (dummy load resistor); 3.4 V min, 4.5 V max (voltage across dummy load).

(b) T8 lamps greater than or equal to 32 W: 300 volts, 0.265 amps, and 910 ohms, at low frequency (60 Hz) and with cathode power. Approximate cathode wattage (with 3.6 V on each cathode): 1.7 W. Cathode characteristics for low resistance (at 3.6 V): 12.0 +/- 2.0 ohms; 4.75 +/- 0.50 (Rh/Rc ratio). Cathode heat for rapid start: 3.6 V (nominal); 2.5 V min; 4.4 V max (limits during operation); 11.0 ohms +/- 0.1 ohms (dummy load resistor); 3.4 V min, 4.5 V max (voltage across dummy load).

(c) T8 lamps less than 32 W: 300 volts, 0.265 amps, and 910 ohms, at low frequency (60 Hz) and without cathode power.

4.1.1.2.2 For 2-Foot U-shaped lamps, use the following reference ballast settings:

(a) T12 lamps: 236 volts, 0.430 amps, and 439 ohms, at low frequency (60 Hz) and with cathode power. Approximate cathode wattage (with 3.6 V on each cathode): 2.0 W. Cathode characteristics for low resistance (at 3.6V): 9.6 ohms (objective), 7.0 ohms (minimum). Cathode heat for rapid start: 3.6 V (nominal); 2.5 V min, 4.0 V max (limits during operation); 9.6 ohms +/- 0.1 ohm (dummy load resistor); 3.4 V min, 4.5 V max (voltage across dummy load).

(b) T8 lamps greater than or equal to 31 W: 300 volts, 0.265 amps, and 910 ohms, at low frequency (60 Hz) and with cathode power. Approximate cathode wattage (with 3.6 V on each cathode): 1.7 W. Cathode characteristics for low resistance (at 3.6 V): 11.0 ohms (objective); 8.0 ohms (minimum). Cathode heat for rapid start: 3.6 V (nominal); 2.5 V min; 4.4 V max (limits during operation); 11.0 ohms +/- 0.1 ohms (dummy load resistor); 3.4 V min, 4.5 V max (voltage across dummy load).

(c) T8 lamps less than 31 W: 300 volts, 0.265 amps, and 910 ohms, at low frequency (60 Hz) and without cathode power.

4.1.1.2.3 For 8-foot slimline lamps, use the following reference ballast settings:

(a) *T12 lamps*: 625 volts, 0.425 amps, and 1280 ohms, at low frequency (60 Hz) and without cathode power.

(b) *T8 lamps*: 625 volts, 0.260 amps, and 1960 ohms, at low frequency (60 Hz) and without cathode power.

4.1.1.2.4 For 8-foot high output lamps, use the following reference ballast settings:

(a) *T12 lamps*: 400 volts, 0.800 amps, and 415 ohms, at low frequency (60 Hz) and with cathode power. Approximate cathode wattage (with 3.6 V on each cathode): 7.0 W. Cathode characteristics for low resistance (at 3.6 V): 3.2 ohms (objective); 2.5 ohms (minimum). Cathode heat requirements for rapid start: 3.6 V (nominal); 3.0 V min, 4.0 V max (limits during operation); 3.2 ohms +/- 0.05 ohm (dummy load resistor); 3.4 V min, 4.5 V max (voltage across dummy load).

(b) *T8 lamps*: 450 volts, 0.395 amps, and 595 ohms, at high frequency (25 kHz) and without cathode power.

4.1.1.2.5 For 4-foot miniature bipin standard output or high output lamps, use the following reference ballast settings:

(a) *Standard Output*: 329 volts, 0.170 amps, and 950 ohms, at high frequency (25 kHz) and without cathode power.

(b) *High Output*: 235 volts, 0.460 amps, and 255 ohms, at high frequency (25 kHz) and without cathode power.

4.1.2 *General Service Incandescent Lamps*: Establish ambient, physical, and electrical conditions in accordance with Sections (and corresponding subsections) 4.0, 5.0, 6.1, 6.3 and 6.4 in IES LM-45-20.

4.1.3 *Incandescent Reflector Lamps*: Establish ambient, physical, and electrical conditions in accordance with Sections (and corresponding subsections) 4.0 and 5.0 in IES LM-20-20.

4.2. *Test Methods, Measurements, and Calculations*

Multiply all lumen measurements made with instruments calibrated to the devalued NIST lumen after January 1, 1996, by 1.011.

4.2.1 General Service Fluorescent Lamps

4.2.1.1 Season and stabilize lamps in accordance with Sections (and corresponding subsections) 6.1, 6.2, 6.3, and 6.4 of IES LM-9-20 and with IES LM-54-20.

4.2.1.2 Measure the initial input power (in watts).

4.2.1.3 Measure initial lumen output in accordance with Section 7.0 (and corresponding subsections) of IES LM-9-20 and with IES LM-78-20.

4.2.1.4 Calculate initial lamp efficacy by dividing the measured initial lumen output by the measured initial input power.

4.2.1.5 Calculate CRI as specified in Section 7.6 of IES LM-9-20 and CIE 13.3. Conduct the required spectroradiometric measurement and characterization in accordance with the methods set forth in IES LM-58-20.

4.2.1.6 Calculate CCT as specified in Section 7.6 of IES LM-9-20 and CIE 15:2018. Conduct the required spectroradiometric measurement and characterization in accordance with the methods set forth in IES LM-58-20.

4.2.2 General Service Incandescent Lamps

4.2.2.1 Season and stabilize lamps in accordance with Section (and corresponding subsections) 6.2 of IES LM-45-20 and with IES LM-54-20.

4.2.2.2 Measure the initial input power (in watts).

4.2.2.3 Measure initial lumen output in accordance with Section (and corresponding subsections) 7.0 of IES LM-45-20 and with IES LM-78-20.

4.2.2.4 Calculate initial lamp efficacy by dividing the measured initial lumen output by the measured initial input power.

4.2.2.5 Calculate CRI as specified in Section 7.4 of IES LM-45-20 and CIE 13.3.

Conduct the required spectroradiometric measurement and characterization in accordance with the methods set forth in IES LM-58-20.

4.2.2.6 Calculate CCT as specified in Section 7.4 of IES LM-45-20 and CIE 15:2018. Conduct the required spectroradiometric measurement and characterization in accordance with the methods set forth in IES LM-58-20.

4.2.3 Incandescent Reflector Lamps

4.2.3.1 Season and stabilize lamps in accordance with Section (and corresponding subsections) 6.0 of IES LM-20-20 and with IES LM-54-20.

4.2.3.2 Measure the initial input power (in watts).

4.2.3.3 Measure initial lumen output in accordance with Sections (and corresponding subsections) 7.0 or 8.0 of IES LM-20-20 and with IES LM-78-20. When measuring in accordance with section 8.0, exclude undirected light using the method specified in section 8.2.

4.2.3.4 Calculate initial lamp efficacy by dividing the measured initial lumen output by the measured initial input power.

4.2.3.5 Calculate CRI as specified in CIE 13.3. Conduct the required spectroradiometric measurement and characterization in accordance with the methods set forth in IES LM-58-20.

4.2.3.6 Calculate CCT as specified in CIE 15:2018. Conduct the required spectroradiometric measurement and characterization in accordance with the methods set forth in IES LM-58-20.

5. Test Method for Voluntary Representations for General Service Fluorescent Lamps

Follow sections 1.0 through 4.0 of this appendix to make voluntary representations only for GSFLs that have high frequency reference ballast settings in

ANSI C78.81-2016 or ANSI C78.901-2016. Where ANSI C78.81-2010 and ANSI C78.901-2005 are referenced in the preceding sections, use ANSI C78.81-2016 and ANSI C78.901-2016 instead. Operate lamps using high frequency reference ballast settings and without cathode power. Voluntary representations must be in addition to, not instead of, a representation in accordance with sections 1.0 to 4.0 of this appendix for GSFLs. As a best practice, an indication of high frequency operation should be provided with the voluntary representations.

6. Test Method for Determining Time to Failure for General Service Incandescent Lamps and Incandescent Reflector Lamps

6.1 *Test Conditions and Setup.* Establish ambient, physical, and electrical conditions as described in Sections (and corresponding subsections) 4.0 and 5.0 of IES LM-49-20.

6.2 Test Methods, Measurements, and Calculations

6.2.1 Season and stabilize lamps according to Section 6.2 of IES LM-45-20 for GSILs and in accordance with Section (and corresponding subsections) 6.0 of IES LM-20-20 for IRLs.

6.2.2 Measure the time to failure as specified in Section 6.4 of IES LM-49-20 and based on the lamp's operating time, expressed in hours, not including any off time.

6.3 Accelerated lifetime testing is not allowed; disregard the second paragraph of Section 6.4 of IES LM-49-20.

14. Amend §430.32 by revising paragraphs (n) and (x) to read as follows:

§430.32 Energy and water conservation standards and their compliance dates.

* * * * *

(n) *General service fluorescent lamps and incandescent reflector lamps.* (1) Each of the following general service fluorescent lamps manufactured after the effective dates specified in the table must meet or exceed the following color rendering index standards:

Lamp type	Nominal lamp watts*	Minimum Color Rendering Index	Effective date
(i) 4-foot medium bipin	>35 W ≤35 W	69 45	Nov. 1, 1995. Nov. 1, 1995.
(ii) 2-foot U-shaped	>35 W ≤ 35 W	69 45	Nov. 1, 1995. Nov. 1, 1995.
(iii) 8-foot slimline	>65 W ≤65 W	69 45	May 1, 1994. May 1, 1994.
(iv) 8-foot high output	>100 W ≤100 W	69 45	May 1, 1994. May 1, 1994.

*Nominal lamp watts means the wattage at which a fluorescent lamp is designed to operate. 42 U.S.C. 6291(29)(H)

(2) The standards described in paragraph (n)(1) of this section do not apply to:

- (i) Any 4-foot medium bipin lamp or 2-foot U-shaped lamp with a rated wattage less than 28 watts;
- (ii) Any 8-foot high output lamp not defined in ANSI C78.81-2010 (incorporated by reference; see §430.3) or related supplements, or not 0.800 nominal amperes; or
- (iii) Any 8-foot slimline lamp not defined in ANSI C78.3 (incorporated by reference; see §430.3).

(3) Each of the following general service fluorescent lamps manufactured on or after January 26, 2018, must meet or exceed the following lamp efficacy standards shown in the table:

Lamp type	Correlated color temperature	Minimum average lamp efficacy lm/W
(i) 4-foot medium bipin lamps (straight-shaped lamp with medium bipin base, nominal overall length of 48 inches, and rated wattage of 25 or more)	≤4,500K	92.4
	>4,500K and ≤7,000K	88.7
(ii) 2-foot U-shaped lamps (U-shaped lamp with medium	≤4,500K	85.0

bipin base, nominal overall length between 22 and 25 inches, and rated wattage of 25 or more)	>4,500K and ≤7,000K	83.3
(iii) 8-foot slimline lamps (instant start lamp with single pin base, nominal overall length of 96 inches, and rated wattage of 49 or more)	≤4,500K	97.0
	>4,500K and ≤7,000K	93.0
(iv) 8-foot high output lamps (rapid start lamp with recessed double contact base, nominal overall length of 96 inches)	≤4,500K	92.0
	>4,500K and ≤7,000K	88.0
(v) 4-foot miniature bipin standard output lamps (straight-shaped lamp with miniature bipin base, nominal overall length between 45 and 48 inches, and rated wattage of 25 or more)	≤4,500K	95.0
	>4,500K and ≤7,000K	89.3
(vi) 4-foot miniature bipin high output lamps (straight-shaped lamp with miniature bipin base, nominal overall length between 45 and 48 inches, and rated wattage of 44 or more)	≤4,500K	82.7
	>4,500K and ≤7,000K	76.9

Note 1 to paragraph (n)(3) For paragraphs (n)(3)(i) through (vi), rated wattage is defined with respect to fluorescent lamps and general service fluorescent lamps in §430.2.

(4) Subject to the sales prohibition in paragraph (dd) of this section, each of the following incandescent reflector lamps manufactured after July 14, 2012, must meet or exceed the lamp efficacy standards shown in the table:

Rated wattage	Lamp spectrum	Lamp diameter inches	Rated voltage of lamp	Minimum average lamp efficacy lm/W
(i) 40-205	Standard Spectrum	>2.5	≥125 V	6.8*P ^{0.27}
			<125 V	5.9*P ^{0.27}
		≤2.5	≥125 V	5.7*P ^{0.27}
			<125 V	5.0*P ^{0.27}
(ii) 40-205	Modified Spectrum	>2.5	≥125 V	5.8*P ^{0.27}
			<125 V	5.0*P ^{0.27}
		≤2.5	≥125 V	4.9*P ^{0.27}
			<125 V	4.2*P ^{0.27}

Note 2 to paragraph (n)(4): P is equal to the rated wattage, in watts. Rated wattage is defined with respect to incandescent reflector lamps in §430.2.

Note 3 to paragraph (n)(4): Standard Spectrum means any incandescent reflector lamp that does not meet the definition of modified spectrum in §430.2.

(5) The standards specified in this section do not apply to the following types of incandescent reflector lamps:

- (i) Lamps rated at 50 watts or less that are ER30, BR30, BR40, or ER40 lamps;
- (ii) Lamps rated at 65 watts that are BR30, BR40, or ER40 lamps; or
- (iii) R20 incandescent reflector lamps rated 45 watts or less.

* * * * *

(x) *General service incandescent lamps, intermediate base incandescent lamps and candelabra base incandescent lamps.* (1) Subject to the sales prohibition in paragraph (dd) of this section, the energy conservation standards in this paragraph apply to general service incandescent lamps.

(i) Intended for a general service or general illumination application (whether incandescent or not);

(ii) Has a medium screw base or any other screw base not defined in ANSI C81.61 (incorporated by reference; see § 430.3); and

(iii) Is capable of being operated at a voltage at least partially within the range of 110 to 130 volts.

(2) Subject to the sales prohibition in paragraph (dd) of this section, general service incandescent lamps manufactured after the effective dates specified in the tables below, except as described in paragraph (x)(3) of this section, must have a color rendering index greater than or equal to 80, a rated wattage no greater than, and a lifetime no less than the values shown in the table below:

GENERAL SERVICE INCANDESCENT LAMPS

Lumen ranges*	Maximum rated wattage	Minimum lifetime**	Effective date
(i) 1490-2600	72	1,000 hrs	1/1/2012

(ii) 1050-1489	53	1,000 hrs	1/1/2013
(iii) 750-1049	43	1,000 hrs	1/1/2014
(iv) 310-749	29	1,000 hrs	1/1/2014

*Use measured initial lumen output to determine the applicable lumen range.

** Use lifetime determined in accordance with 10 CFR 429.27 to determine compliance with this standard.

(3) Subject to the sales prohibition in paragraph (dd) of this section, modified spectrum general service incandescent lamps manufactured after the effective dates specified must have a color rendering index greater than or equal to 75, a rated wattage no greater than, and a lifetime no less than, the values shown in the table below:

MODIFIED SPECTRUM GENERAL SERVICE INCANDESCENT LAMPS

Lumen ranges*	Maximum rated wattage	Minimum lifetime**	Effective date
(i) 1118-1950	72	1,000 hrs	1/1/2012
(ii) 788-1117	53	1,000 hrs	1/1/2013
(iii) 563-787	43	1,000 hrs	1/1/2014
(iv) 232-562	29	1,000 hrs	1/1/2014

*Use measured initial lumen output to determine the applicable lumen range.

** Use lifetime determined in accordance with 10 CFR 429.27 to determine compliance with this standard.

(4) Subject to the sales prohibition in paragraph (dd) of this section, each candelabra base incandescent lamp must not exceed 60 rated watts.

(5) Subject to the sales prohibition in paragraph (dd) of this section, each intermediate base incandescent lamp must not exceed 40 rated watts.

* * * * *